BID DOCUMENTS COVER SHEET

CONTRACT DOCUMENTS

FOR

D-1045E Library Building HVAC

AT

Diablo Valley College
321 Golf Club Road, Pleasant Hill, CA 94523

CONTRA COSTA COMMUNITY COLLEGE DISTRICT

Consist of the following:

ADDENDUM # 1

DSA File # 7-C1, DSA Application # 01-115191
Alfa Tech Engineers: Project # 214328
1321 Ridder Park Drive No 50
San Jose, CA 95131

3/3/2016
NOTICE TO ALL CONTRACTORS

You are hereby notified of the following changes, clarifications and/or modifications to the original Contract Documents, Project Manual, Drawings, Specifications and/or previous Addenda. This Addendum shall supersede the original Contract Documents and previous Addenda wherein it contradicts the same, and shall take precedence over anything to the contrary therein. All other conditions remain unchanged.

This Addendum forms a part of the Contract Documents and modifies the original Contract Documents dated October 15, 2015. Acknowledge receipt of this Addendum in space provided on the Bid Proposal Form. Failure to acknowledge may subject Bidder to disqualification.

A. Deletions, Additions, Changes, Revisions

Item:

1. REVISED BID DATE – Bids are due no later than Tuesday, March 15th, 2016 at 2:00PM.

Specification Changes:

Item 1  Specification Section 00300-Bid Proposal (attached)
   a. Section revised.

Item 2  Specification Section 01030 Alternates (attached)
   a. Section revised.
ADDENDUM #1

Item 3  Specification Section 23 02 12  2.4 b.
   a. Added paragraph “2.2 H. Ground the shaft of motors served by variable frequency drives.”

Item 4  Specification Section 23 09 23 (Reissued in Full)
   a. Entire Section replaced.

Item 5  Specification Section 23 09 23 3.7
   a. System training, including Controls, has been moved to 23 00 00 Mechanical General Requirements.
      “23 00 00 1.11 E.
      1. Provide training for District Personnel as follows:
         a. Provide 8 hours of training for all new systems upon substantial completion.
         b. Provide 16 hours of training for all new systems 2 months after substantial completion.”

Item 6  Specification Section 23 21 13/3.9/A
   a. Temporary pump for flushing and cleaning of system added:
      3.9 CLEANING
      A. Flush and clean hydronic piping systems with temporary, contractor furnished pump with clean water. After cleaning and flushing hydronic piping systems, but before balancing, remove the temporary pumps and install the final pumps.”

Item 7  Specification Section 23 65 00 2.1 F.1.
   a. The Cooling Tower Basin and the wetted components have been specified as stainless steel:
      1. The cold water basin shall be constructed of type 304 stainless steel and assembled with type 304 stainless steel nut and bolt fasteners. The basin shall be provided with large area lift out strainers with perforated openings sized smaller than the water distribution system nozzles and an anti-vortexing device to prevent air entrainment. The strainer and anti-vortexing device shall be constructed of type 304 stainless steel to prevent dissimilar metal corrosion. Standard basin accessories shall include a type 304 stainless steel make-up valve with large diameter polystyrene filled plastic float for easy adjustment of the operating water level. Circular access doors shall be provided for easy access to the make-up water assembly and suction strainer for routine maintenance.
a. The redundant controls that were indicated as being part of the cooling tower control package have been eliminated:

T. Control Package: Factory installed and wired, and functionally tested at factory before shipment.

1. Fifteen subparagraphs below are optional features. Retain applicable subparagraphs, based on Project conditions, to require these features and to correspond with components retained in paragraphs above.

2. NEMA 250, Type 3R enclosure with removable internally mount back plate.
3. Control-circuit transformer with primary and secondary side fuses.
4. Terminal blocks with numbered and color-coded wiring to match wiring diagram. Spare wiring terminal block for connection to external controls or equipment.
5. Microprocessor-based controller for automatic control of fan based on cooling tower leaving water temperature with control features to improve operating efficiency based on outdoor ambient wet-bulb temperature by using adaptive logic.
6. Fan motor sequencer for multiple cell and two-speed applications with automatic lead stage rotation.
10. Vibration switch for each fan, complying with requirement in "Vibration Switch" Paragraph.
11. Oil-level switch for each fan with a gear drive, complying with requirement in "Gear-Drive, Oil-Level Switch" Paragraph.
12. Single-point, field-power connection to a nonfused disconnect switch.
   a. Branch power circuit to each motor and electric basin heater and to controls with a disconnect switch or circuit breaker.
   b. NEMA-rated motor controller, hand-off-auto switch, and overcurrent protection for each motor. Provide variable frequency controller with manual bypass and line reactors for each variable-speed motor indicated. Factory-installed wiring outside of enclosures shall be in metal raceway, except make connections to each motor and electric basin heater with liquidtight conduit.
13. Visual indication of status and alarm with momentary test push button for each motor.
ADDENDUM #1


15. Audible alarm and silence switch.

16. Visual indication of elapsed run time, graduated in hours for each motor.

18. Cooling tower shall have hardware to enable BMS to remotely monitor and display the following:

Item 9  Specification Section 23 73 13
   a. We are matching (E) unit due to the limited space of the mechanical room. The fan wall unit will not fit in the present size of the existing mechanical room.

Mechanical Drawing Changes:

Item 10 Drawings, G0.1 (Drawing # AD1M1 - attached)
   a. Add Alternate #1 (two boilers) included in the Scope of Work

Item 11 Drawings, G0.3 (Drawing # AD1M2 - attached)
   a. Outside air requirements and Typical Water By-pass Detail added.

Item 12 Drawings ME2.1 (Drawing # AD1M3 - attached)
   a. Sheet Note 11 revised to reflect new chemical treatment system.

Item 13 Drawings MP 2.1 (Drawing # AD1M4 - attached)
   a. Backflow preventor added to isolate domestic cold water from the industrial cold water.

Item 14 Drawings MP2.1 (Drawing # AD1M5 - attached)
   a. Cooling tower drain modified to terminate over new sanitary sewer floor sink.

Item 15 Drawings M4.1 (Drawing # AD1M6 - attached)

Item 16 Drawings M5.1 (Drawing # AD1M7 - attached)
   a. Temporary piping connections located.

Item 17 Drawings M5.1 (Drawing # AD1M8 - attached)
   a. New expansion tank piping indicated.

Item 18 Drawings M5.2 (Drawing # AD1M9 - attached)
   a. Temporary by-pass, chemical treatment, flexible connections and ne cooling tower drain to sanitary sewer indicated.

Item 19 Drawing  M6.1 (Drawing # AD1M10 - attached)
   a. Detail 5 (Cooling Tower Drain) added.

Item 20 Drawing M6.1 (Drawing # AD1M11 - attached)
Item 21  Drawings M7.1 (Drawing # AD1M12 - attached)
  a.  Added RA Temp Sensor, Building Pressure Sensor and revised the system protocol to the Air Handling Unit Control Diagram.

Item 22  Drawings M7.1 (Drawing # AD1M13 - attached)
  a.  Added speed inputs from VFD, OA Sensor and revised the system protocol for the Heating Hot Water System Control Diagram.

Item 23  Drawings M7.1 (Drawing # AD1M14 - attached)
  a.  Revised Note 9 on the AHU VAV System and Note 5 on the Hot Water System.

Item 24  Drawings M7.2 (Drawing # AD1M15 - attached)
  a.  Added the speed input from the VFD on the Chiller/Cooling Tower Control Diagram.

Item 25  Drawings M7.2 (Drawing # AD1M16 - attached)
  a.  Revised Control System from Alerton to Andover.

Item 26  Drawing MP2.1A (attached)
  a.  Drawing issued in its entirety.

**Electrical Drawing Changes:**

Item 27  Drawings E1.1 (Drawing # AD1E1 - attached)
  a.  Added power connection for temporary AHU and Chiller Units.

Item 28  Drawings E2.1 (Drawing # AD1E2 - attached)
  a.  Included Add Alternate #1 (Second Boiler) in the Mechanical Room

B. If you have any questions regarding this Addendum, please contact:

  **Jovan Esprit – Contracts Manager**
  **Contra Costa Community College District**
  **500 Court St., Martinez, CA 94553**
  Email: jesprit@4cd.edu ;

All other terms and conditions of BID are to remain the same.

**Alfa Tech**
**1321 Ridder Park Drive No 50**
**San Jose CA 95131**
ADDENDUM #1

Architect of Record: Tim Chadwick

Division of the State Architect

END OF ADDENDUM #1
SECTION 00300  
BID PROPOSAL FORM

PROJECT NUMBER / NAME: ______________________________________________________

CAMPUS / LOCATION: ________________________________________________________

DISTRICT: CONTRA COSTA COMMUNITY COLLEGE DISTRICT  
500 Court St, Martinez, CA 94553

Herein Referred to as "District"

1. INTRODUCTION

A. The Bidder proposes to perform the Work for the Contract Sum and within the proposed Contract Time, based upon an examination of the site and the Bid and Contract Documents.

B. The Bidder certifies this Bid is submitted in good faith.

C. The Bidder agrees that the Contract Sum and other proposed terms will be considered in evaluating Bids and may be negotiated and adjusted before awarding of Contract.

D. The signed copy of the Certification of the Visit to the Site shall be attached to the Bid Form Submittal.

E. A fully executed Statement of Bidder's Qualifications signed by an authorized officer of the Bidder submitting the Bid shall be attached to the Bid Form.

F. A fully executed Non-Collusion Affidavit signed by an authorized officer of the Bidder submitting Bid shall be attached to the Bid Form.

G. The District shall award the contract to the lowest responsive and responsible Bidder. The evaluation of the low bid shall be based on the summation of BASE BID ITEM #1 and ITEM #2. In the event of a conflict, the dollar amount listed under TOTAL BASE BID will be used to determine the bid award. Alternates will not be used in determining the low bid.

H. The District reserves the right to award the other Additive/Deductive Alternates through change orders as budget allows.
2. CONTRACT SUM

A. BASE BID

ITEM #1:
D-1045E Library Boiler/Chiller/AHU/Pumps/VFDs: For labor, materials, bonds, fixtures, equipment, tools, transportation, services, sales taxes and other costs necessary to complete the general construction in accordance with the Contract Documents, for a stipulated Contract Sum in the amount of:

____________________________________________ Dollars    ($______________________)

ITEM #2:
D-1033 Library Building Cooling Tower and building switchboard: For labor, materials, bonds, fixtures, equipment, tools, transportation, services, sales taxes and other costs necessary to complete the general construction in accordance with the Contract Documents, for a stipulated Contract Sum in the amount of:

____________________________________________ Dollars    ($______________________)

TOTAL BASE BID (ITEM 1 + ITEM 2)

____________________________________________ Dollars    ($______________________)

B. ALTERNATES

ALTERNATE #1:
All material, labor, equipment, and other related costs for the two boiler system shown on sheet MP2.1A.

____________________________________________ Dollars    ($______________________)

ALTERNATE #2:
All material, labor, equipment, and other related costs to install underground conduit shown within the “Add Alternate” area on sheet E2.1.

____________________________________________ Dollars    ($______________________)

Contra Costa Community College District
Diablo Valley College
D-1045E Library Building HVAC

Section 00300 - Page 2 of 6
Bid Proposal Form
ADDENDUM #1
3. COMPLETION TIME

A. For establishing the Date of Final Completion the contract time for the Base Bids and Alternates shall be 125 calendar days after date of the Notice To Proceed. This time may be subject to modification to facilitate the work as mutually agreed upon at a later date.

B. The Bidder certifies that the Bid is based on the Contract Time for completion as stated above and in the Contract Documents. Bidder further certifies that the Base Bid amount is sufficient to cover all labor, materials, central office and construction site overhead, profit, and all other costs related to the completion of the Project for the entire Project construction time for both the General Contractor and all Subcontractors, as stated above in paragraphs 2 and 3.

4. ADDENDA

A. The Bidder acknowledges receipt of the following Addenda, and certifies the Bid has provided for all modifications and considerations required therein.

   | Addendum No. | Dated |
---|---|---|
|       |       |

B. List of Additional Addenda Attached: Yes [ ] No. [ ].

5. DESIGNATION OF SUBCONTRACTORS

A. The Bidder has set forth a complete list indicating the type of work, name, and business address of each Subcontractor who will perform work in excess of one-half of one percent of the Contract Sum.

B. Any portion of the work in excess of the specified amount having no designated Subcontractor shall be performed by the Bidder.

C. Substitution of listed Subcontractors will not be permitted unless approved in advance by the District.

D. Prior to signing the Contract, the District reserves the right to reject any listed Subcontractor.
Type of Work | Subcontractor’s | Business Address | License #
--- | --- | --- | ---
(1) | | | |
(2) | | | |
(3) | | | |
(4) | | | |
(5) | | | |

E. Complete list of Subcontractors is attached: Yes [ ] No [ ]

F. Continuation list of Subcontractors is attached: Yes [ ] No [ ]

6. ACCEPTANCE AND AWARD

A. The District reserves the right to reject this Bid and to negotiate changes before or after execution of the Contract. This Bid shall remain open and shall not be withdrawn for a period of 90 days after Bid Opening date.

B. If written notice of acceptance of this Bid is mailed or delivered to the Bidder within 90 days after the date set for the receipt of this Bid, or other time before it is withdrawn, the Bidder will execute and deliver to the District a Contract prepared by District with the required Surety Bonds and Certificates of Insurance, within 10 days after personal delivery or deposit in the mail of the notification of acceptance.

C. Notice of acceptance or request for additional information may be addressed to the Bidder at the address provided.

7. BID SECURITY

A. The required 10 percent (10%) Bid Security for this Bid is attached in the form of:

( ) Bid Bond Issued By: ________________________________

( ) Certified or Cashier’s Check No. ________________________________

Issued by: ________________________________

8. BIDDER’S BUSINESS INFORMATION

A. Individual [ ]:

______________________________

Personal Name: ________________________________
Business Name: ________________________________
Address: ______________________________________
__________________ Zip Code: ______________

**Telephone:**

____________________________________________
Fax Number: ____________________________________

**B. Partnership [ ]:** __________________________
Co-partners’ Names: _____________________________
Business Name: _________________________________
Address: ______________________________________
__________________ Zip Code: ______________
Telephone: _____________________________________
Fax Number: ____________________________________

**C. Corporation [ ]:** __________________________
Firm Name: _____________________________________
Address: ______________________________________
__________________ Zip Code: ______________
Telephone: _____________________________________
Fax Number: ____________________________________

State of Incorporation: ____________________________
President: ________________________________
Secretary: ________________________________
Treasurer: ________________________________
Manager: ________________________________

D. **Power of Attorney:**
   Name: ________________________________
   Title: ________________________________

E. **Contractor License No.** _______ State of ____________

F. Bidder is submitting this proposal on behalf of a Joint Venture. Names, license numbers, and relevant information are given on a separate attachment:
   Yes [ ] No [ ].

G. Upon request, furnish appropriate documentation to substantiate and/or support the data given.

9. The undersigned hereby certifies under penalty of perjury under the laws of the State of California that all the information submitted by the Bidder in connection with this Bid and all the representations herein made are true and correct.

Executed this day of __________________________

________________________
Contractor’s License No. Expiration Date

________________________
Firm Name

________________________
Signature

________________________
By (Print or Type Name)

________________________
Title

End of Section 00300
SECTION 01030
ALTERNATES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
A. All Contract Documents shall be reviewed for applicable provisions related to the provisions in this document, and provisions in the General Conditions and other Division 1 Specification Sections shall apply to this Section without limitation.

1.2 RELATED REQUIREMENTS SPECIFIED IN OTHER SECTIONS
A. Section 00200 – “Instructions to Bidders”
B. Section 00300 – “Bid Proposal Form”
C. Section 01010 – “Summary of Work”
D. Section 01311 – “Project Management and Coordination”
E. Section 01330 – “Submittal Procedures”
F. Section 01740 – “Warranties and Guarantees”
G. Section 01770 – “Contract Closeout Procedures”
H. Divisions 2 through 16 Sections for Alternates requirements for the work in those Sections.

1.3 SUMMARY
A. This Section includes administrative and procedural requirements governing Alternates. Each Alternate is identified by number and describes the basic changes to be made in the Work.

1.4 REQUIREMENTS
A. Alternate pricing quoted on the Bid Proposal Form will be reviewed by the District, and accepted or rejected at District’s sole option. Any accepted Alternate(s) will be identified in the District-Contractor Agreement.
B. See the Bid Proposal Form, Section 00300. Item 1.G, for District Bid evaluation procedure.
C. All Alternates are either “additive” or “deductive” or “no change” to the Lump Sum Base Bid. The Contractor shall quote the amount for each Alternate in the space provided on the Bid Proposal Form.
D. Failure to either quote an Alternate amount or the insertion of the words “no bid,” “none” or words of similar import, may be considered as not completing the Bid Proposal Form and may constitute disqualification of the entire bid at District’s sole discretion. Bidders may insert a zero dollar amount ($0.00) in the Alternate price line of the Bid Proposal Form if the Bidder proposes to perform the Work of the Alternate with no additional change to the Contract Sum.
E. The Base Bid and the Alternates are exclusive in their scope of Work. There is no overlap between or among the Base Bid and the Alternates.

F. The cost of any item of work shall be included only once, in the Base Bid or in the Alternates.

G. Each Alternate is intended to cover all of the Work required for a complete, finished job.
   1. Alternate Work includes all miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of the Alternate, but necessary to complete the Alternate Work according to the Contract Documents.

1.5 PROCEDURES
   A. Modify or adjust affected adjacent Work as necessary to completely integrate Work of each accepted Alternate into the Project.
   B. Notification: Immediately following award of the Contract, Contractor shall notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
   C. Execute accepted Alternate(s) under the same conditions as other Work of this Contract.

PART 2 - PRODUCTS

2.1 DESCRIPTION OF ALTERNATES
   A. Alternates are listed in Part 2 of the Bid Proposal Form, and hence are identified below Alternate #1, Alternate #2, etc.
      1. **Alternate #1** – Provide an alternate bid for a two boiler system shown on sheet MP2.1A, E2.1 and as defined in Scope of Work note on sheet G0.1 (note added in Addendum #1).
      2. **Alternate #2** – Provide an alternate bid for a complete conduit pathway in the area identified on sheet E2.1 as “ADD ALTERNATE”. The alternate bid is to include all excavation, backfill, replacement in-kind of existing surfaces, and the pull box at the end of the run to the north. The alternate is not to include the pull box on the south end of the run. The Base Bid is to include 5’ of the conduit identified on E2.1 stubbed out from the south pull box and capped for future use.

PART 3 - EXECUTION

3.1 GENERAL
   A. Execute accepted alternates under the same conditions as other Work of this Contract.
   B. Coordination: Modify or adjust affected Work as required to completely and fully integrate that Work into the Project.

END OF SECTION 01030
SECTION 23 09 23

BUILDING AUTOMATION SYSTEM (BACnet) and (Infinet)

PART 1  GENERAL

1.01 CONDITIONS OF THE CONTRACT:

A. The Conditions of the Contract (General, Supplementary, and other Conditions) and the General Requirements (Sections of Division 1) are hereby made a part of this Section.

B. Division - 15 Basic Mechanical Materials and Methods apply to work of this section.

1.02 WORK INCLUDED:

A. Related Documents: The General Provisions of the Contract, including General, Supplementary, and Special Conditions, and Division 1 - General Requirements, apply to work specified in this section. Subcontractor must familiarize himself with the terms of the above documents.

1. The Building Automation System (BAS) is to be furnished and installed by a factory authorized Andover distributor with factory warranted Andover parts. The designated distributor for this work is EMCOR Services Integrated Solutions (Contractor). Contact: Andy Bruch; andy_bruch@emcorgroup.com; 510-909-9980

   a. All bidders must be building automation contractors in the business of installing Direct Digital Controls (DDC) for a minimum of 3 years.

   b. All bidders must have an office in the San Francisco Bay/Central Valley area.

   c. All bidders must be a channel partner for “Andover Controls”.

   d. All bidders must have a trained staff of application engineers, who have been certified by Andover in Administration, Networking, Configuration, Programming and service of the automation system.

   e. All installers must have a factory-trained technician on-site at all times during installation of the DDC controls.

2. Integration of the BAS system to the central BAS system shall be coordinated with the Facilities Manager at the work site.

B. Scope of Work

1. The BAS contractor shall review and study all HVAC drawings and the entire specification to familiarize him with the equipment and system operation and to verify the quantities and types of valves, operators, alarms, etc. to be provided.

2. The Contractor shall furnish and install a complete building automation system including all necessary hardware and all operating and applications software necessary to perform the control sequences of operation as called for in this specification. Andover Controls Only to match existing campus system architecture. At a minimum, provide controls for the following:

   a. Air handling unit.

   b. Exhaust fan.

   c. Boiler

   d. Chiller
e. Cooling Tower
f. Pumps
g. Power wiring to DDC devices and BAS panels by Division.

3. Provide services and manpower necessary for commissioning of system in coordination with the HVAC Contractor, Balancing Contractor and Owner's representative.

4. All work performed under this section of the specifications will comply with all codes, laws and governing bodies. If the drawings and/or specifications are in conflict with governing codes, the Contractor shall submit a proposal with appropriate modifications to the project to meet code restrictions. If this specification and associated drawings exceed governing code requirements, the specification will govern.

C. Training: Provide a minimum of (40) hours of on-site training for (3) system operators. The training will be hands-on type at the owner's office. The training class will use the actual Operator's Manual that will be submitted for this project. Portable handheld assist tools: Provide owner with one Roam I/O remote assist tool as indicated by Facilities at time of completion.

D. System Description:
   1. The Building Automation System (BAS) shall consist of PC-based workstation (existing) and microcomputer controllers of modular design providing distributed processing capability, and allowing future expansion of both input/output points and processing/control functions:
      a. For this project the system shall consist of the following (new) components:
         1) Ethernet-based Network Controller.
         2) Stand-alone Digital Control Units.

E. Ethernet-based Network Controller: The BAS Contractor shall furnish (1) Ethernet-based network controller. This controller will connect directly to the campus LAN over the existing Ethernet system. (1) Building network controller (as required) and shall be assigned to an existing BACnet communication line.

F. Provide the necessary quantity and types of SDCUs to meet the requirements of the project for mechanical equipment control including air handlers, return/exhaust fans, and terminal unit control. Each SDCU will operate completely standalone, containing all of the I/O and programs to control its associated equipment; b3 series (BACnet).

G. Work by Others
   1. The BAS Contractor shall cooperate with other contractors performing work on this project necessary to achieve a complete and neat installation. To that end, each contractor shall consult the drawings and specifications for all trades to determine the nature and extent of others' work.
   2. The BAS Contractor shall furnish all control valves, sensor wells, flow meters and other similar equipment for installation by the Mechanical Contractor
   3. The Electrical Contractor shall provide:
      a. All 120volts power wiring to control Transformer.

H. Code Compliance
   1. All wiring shall conform to the National Electrical Code.
   2. Comply with FCC rules, Part 15 regarding Class A radiation for computing devices and low power communication equipment operating in commercial environments.

I. Submittals

1. All shop drawings shall be prepared in AutoCAD software. In addition to the drawings, the Contractor shall furnish a diskette containing the identical information. Drawings shall be B size or larger.

2. Shop drawings shall include a riser diagram depicting locations of all controllers and workstations, with associated network wiring. Also included shall be individual schematics of each mechanical system showing all connected points with reference to their associated controller. Typical will be allowed where appropriate.

3. Submittal data shall contain manufacturer's data on all hardware and software products required by the specification. Valve, damper and airflow station schedules shall indicate size, configuration, capacity and location of all equipment.

4. Software submittals shall contain narrative descriptions of sequences of operation, program listings, point lists, and a complete description of the graphics, reports, alarms and configuration to be furnished with the workstation software. Information shall be bound or in a three ring binder with an index and tabs.

5. Submit five (5) copies of submittal data and shop drawings to the Engineer and (one) copy to Facilities for review prior to ordering or fabrication of the equipment. The Contractor prior to submitting shall check all documents for accuracy.

6. The Engineer will make corrections, if required, and forward to Facilities prior to returning to the Contractor. The Contractor will then resubmit with the corrected or additional data. This procedure shall be repeated until all corrections are made to the satisfaction of the Engineer and the submittals are fully approved.

J. System Startup & Commissioning

1. Each point in the system shall be tested for both hardware and software functionality. In addition, each mechanical and electrical system under control of the BAS will be tested against the appropriate sequence of operation specified herein. Successful completion of the system test shall constitute the beginning of the warranty period. A written report will be submitted to the owner indicating that the installed system functions in accordance with the plans and specifications.

2. The BAS contractor shall commission and set in operating condition all major equipment and systems, such as the chilled water, hot water and all air handling systems, in the presence of the equipment manufacturer's representatives, as applicable, and the Owner and Architect’s representatives.

3. The BAS Contractor shall provide all manpower and engineering services required to assist the HVAC Contractor and Balancing Contractor in testing, adjusting, and balancing all systems in the building. The BAS Contractor shall have a trained technician available on request during the balancing of the systems. The BAS Contractor shall coordinate all requirements to provide a complete air balance with the Balancing Contractor and shall include all labor and materials in his contract.
K. Training

1. The BAS Contractor shall provide both on-site and classroom training to the Owner's representative and maintenance personnel per the following description:

2. On-site training shall be per section 1.02 D and shall consists of "hands-on" instruction geared at the operation and maintenance of the systems. The curriculum shall include
   a. System Overview.
   c. System access.
   d. Software features overview.
   e. Changing setpoints and other attributes.
   f. Scheduling.
   g. Editing programmed variables.
   h. Displaying color graphics.
   i. Running reports.
   j. Workstation maintenance.
   k. Application programming.
   l. Operational sequences including start-up, shutdown, adjusting and balancing.
   m. Equipment maintenance.

L. Operating and Maintenance Manuals

1. The operation and maintenance manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the entire BAS. This documentation shall include specific part numbers and software versions and dates. A complete list of recommended spare parts shall be included with the leadtime and expected frequency of use of each part clearly identified.

2. Following project completion and testing, the BAS contractor will submit as-built drawings reflecting the exact installation of the system. The as-built documentation shall also include a copy of all application software both in written form and on diskette.

M. Warranty: The BAS contractor shall warrant the system for 12 months after system acceptance and beneficial use by the owner. During the warranty period, the BAS contractor shall be responsible for all necessary revisions to the software as required to provide a complete and workable system consistent with the letter and intent of the Sequence of Operation section of the specification.
PART 2 PRODUCTS

2.01 SYSTEM ARCHITECTURE:

A. General: The Building Automation System (BAS) shall consist of Network Control Units (NCUs), a family of Standalone Digital Control Units (SDCUs), Input/Output Unit Modules (IOU Modules), Operator Workstations (OWs), and one File Server to support system configurations where more than one operator workstation is required. The BAS shall provide control, alarm detection, scheduling, reporting and information management for the entire facility, and Wide Area Network (WAN) if applicable, from a single ODBC-compliant database.

B. Level 1 Network Description: Level 1, the main backbone of the system, shall be an Ethernet LAN/WAN. Network Control Units, Operator Workstations, and the Central File Server shall connect directly to this network without the need for Gateway devices.

C. Level 2 Network Description

1. Level 2 of the system shall consist of one or more field buses managed by the Network Control Units. The Level 2 field buses may consist of one or both of the following types:
   a. An RS485, token passing bus that supports up to 127 Standalone Digital Control Units (SDCUs) per communication port for operation of HVAC equipment and lighting, or
   b. An RS485 field bus that supports up to 32 devices from a family of plug-in, IOU modules.

2. These IOU modules may be mounted within the NCU enclosure or remotely mounted via a single, twisted, shielded pair of wires.

D. BAS: The BAS shall be capable of being segmented, through software, into multiple local area networks (LANs) distributed over a wide area network (WAN), sharing a single file server. This enables workstations to manage a single LAN (or building), and/or the entire system with all devices being assured of being updated by and sharing the most current database. In the case of a single workstation system, the workstation shall contain the entire database – with no need for a separate file server.

E. Standard Network Support: All NCUs, and BACNET MS/TP Workstation(s) and File Server shall be capable of residing directly on the owner's Ethernet TCP/IP LAN/WAN with no required gateways. Furthermore, the NCU's, Workstation(s) and File Server shall be capable of using standard, commercially available, off-the-shelf Ethernet infrastructure components such as routers, switches and hubs. With this design the owner may utilize the investment of an existing or new enterprise network or structured cabling system. This also allows the option of the maintenance of the LAN/WAN to be performed by the owner’s Information Systems Department as all devices utilize standard TCP/IP components.

F. System Expansion

1. The BAS system shall be scalable and expandable at all levels of the system using the same software interface, and the same Level 1 and Level 2 controllers. Systems that require replacement of either the workstation software or field controllers in order to expand the system shall not be acceptable.

2. The BAS shall be expandable to include Security and Access Control functions at any time in the future with no additional workstations, front-end software or Level 1 controllers required. Standalone Digital Control Units or IOU modules shall be able to be added to the existing Level 1 controller's field bus (es), to perform security and card access applications. In this way, an owner’s existing investment in wiring infrastructure may be leveraged and the cost and inconvenience of adding new field bus wiring will
be minimized.

3. Additionally, an integrated video badging option must be able to be included with no additional workstations required. This photo ID option must share the same database as the BAS in order to eliminate the need for updating multiple databases.

4. The system shall use the same application programming language for all levels: Operator Workstation, Network Control Unit, Remote Site Control Unit and Standalone Digital Control Unit. Furthermore, this single programming language shall be used for all applications: environmental control, card access control, intrusion detection and security, lighting control, leak detection / underground storage tank monitoring, and digital data communication interfaces to third party microprocessor-based devices.

G. Support for Open Systems Protocols

1. The BAS design must include solutions for the integration of the following “open systems” protocols: BACnet, LonTalk™, MODBUS and digital data communication to third party microprocessors such as chiller controllers, fire panels and variable frequency drives (VFDs).

2. The system shall also provide the ability to program custom ASCII communication drivers that will reside in the NCU, for communication to third party systems and devices. These drivers will provide real time monitoring and control of the third party systems.

2.02 NETWORK CONTROL UNITS (NCUs)

A. General

1. Network Control Units shall be microprocessor based, multi-tasking, multi-user, and employ a real time operating system. Each NCU control panel shall consist of modular hardware including power supply, CPU board, and input/output modules. A sufficient number of NCUs shall be supplied to fully meet the requirements of this specification and the attached point list.

2. NCUs for telephone dialup sites shall be of the same design as the Ethernet control units but without the plug-in Ethernet network interface card (NIC), i.e., NCUs, which include a NIC, shall be interchangeable whether used on a LAN/WAN or a dialup site.

B. Websserver Functionality

1. All NCUs on the Ethernet TCP/IP LAN/WAN shall be capable, out-of-the-box, to be set up as a Web Server. The NCU shall have the ability to store HTML code and "serve" pages to a web browser. This provides the ability for any computing device utilizing a TCP/IP Ethernet connection and capable of running a standard Internet browser (Microsoft Internet Explorer™, Netscape Navigator™, etc.) to access real-time data from the entire BAS via any NCUs.

2. Graphics and text-based web pages shall be constructed using standard HTML code. The interface shall allow the user to choose any of the standard text or graphics-based HTML editors for page creation. It shall also allow the operator to generate custom graphical pages and forms.

3. The WEB server interface shall be capable of password security, including validation of the requesting PC's IP address. The WEB server interface shall allow the sharing of data or information between any controller, or process or network interface (BACnet, LonTalk and TCP/IP) that the BMS has knowledge of, regardless of where the point is connected on the BAS network or where it is acquired from.
4. The BAS network controller must act directly as the WEB server. It must directly generate the HTML code to the requesting user (i.e. WEB browser), eliminating the need for and reliance on any PC-based WEB server hardware or software. To simplify graphic image space allocation, HTML graphic images, if desired, shall be stored on any shared network device. The BAS WEB server shall have the ability to acquire any necessary graphics using standard pathing syntax within the HTML code mounted within the BAS WEB server. External WEB server hardware and software are not acceptable.

C. Hardware Specifications

1. Memory: A minimum of 32 MB of RAM shall be provided for NCUs and shall include a floating-point math co-processor.

D. Communication Ports: Each NCU shall provide communication to both the Workstation(s) and the field buses. In addition, each NCU must have other communications ports that support a portable service tool and connection to third party controllers such as a chiller control panel. On a LAN/WAN system the NCU shall be provided with a 10/100 baseT Mbps plug-in Ethernet TCP/IP network interface card (NIC).

E. Input/Output (I/O):

1. Each NCU shall support the addition of the following types of inputs and outputs:
   a. Digital Inputs for status/alarm contacts.
   b. Counter Inputs for summing pulses from meters.
   c. Thermistor inputs for measuring temperatures in space, ducts and thermowells.
   d. Analog inputs for pressure, humidity, flow and position measurements.
   e. Digital Outputs for on/off equipment control.
   f. Analog Outputs for valve and damper position control, and capacity control of primary equipment.

F. Modular Expandability: The system shall employ a modular I/O design to allow easy expansion. Input and output capacity is to be provided through plug-in modules of various types or DIN-mountable IOU modules. It shall be possible to combine I/O modules as desired to meet the I/O requirements for individual control applications.

G. Real Time Clock (RTC): Each NCU shall include a battery-backed, real time clock, accurate to 10 seconds per day. The RTC shall provide the following: time of day, day, month, year, and day of week. In normal operation the system clock will be based on the frequency of the AC power. The system shall automatically correct for daylight savings time and leap years and be Year 2000 compliant.

H. Automatic Restart After Power Failure: Upon restoration of power after an outage, the ECU shall automatically and without human intervention: update all monitored functions; resume operation based on current, synchronized time and status, and implement special start-up strategies as required.

I. Battery backup: Each NCU with the standard 120-220VAC power supply shall include a programmable DC power backup system rated for a minimum of 72 hours of battery backup to maintain all volatile memory or, a minimum of 2 hours of full UPS including modem power. This power backup system shall be configurable such that at the end of a settable timeframe (such as 1 hour) of running on full UPS, the unit will shut off full UPS and switch to memory retention-only mode for the remainder of the battery power. The system shall allow the simple addition of more batteries to extend the above minimum battery backup times. Each NCU with a control transformer shall include a minimum of 7 days of power failure backup of RAM memory.
J. Software Specifications: User Programming Language: The application software shall be user programmable. This includes all strategies, sequences of operation, control algorithms, parameters, and setpoints. The source program shall be English language-based and programmable by the user. The language shall be structured to allow for the easy configuration of control programs, schedules, alarms, reports, telecommunications, local displays, mathematical calculations, passwords, and histories. The language shall be self-documenting. Users shall be able to place comments anywhere in the body of a program. Program listings shall be configurable by the user in logical groupings.

K. Control Software:
   1. The NCU shall have the ability to perform the following pre-tested control algorithms:
      a. Proportional, Integral plus Derivative Control (PID).
      b. Self Tuning PID.
      c. Two Position Control.
      d. Digital Filter.
      e. Ratio Calculator.
      f. Equipment Cycling Protection.

L. Mathematical Functions: Each controller shall be capable of performing basic mathematical functions (+, -, *, /), squares, square roots, exponential, logarithms, Boolean logic statements, or combinations of both. The controllers shall be capable of performing complex logical statements including operators such as >, <, =, and, or, exclusive or, etc. These must be able to be used in the same equations with the mathematical operators and nested up to five parentheses deep.

M. Energy Management Applications:
   1. NCUs shall have the ability to perform any or all of the following energy management routines:
      a. Time of Day Scheduling.
      b. Calendar Based Scheduling.
      c. Holiday Scheduling.
      d. Temporary Schedule Overrides.
      e. Optimal Start.
      f. Optimal Stop.
      g. Night Setback Control.
      h. Enthalpy Switchover (Economizer).
      i. Peak Demand Limiting.
      j. Temperature Compensated Duty Cycling.
      k. CFM Tracking.
      l. Heating/Cooling Interlock.
      m. Hot/Cold Deck Reset.
      n. Free Cooling.
      o. Hot Water Reset.
N. History Logging: Each controller shall be capable of logging any system variable over user defined time intervals ranging from 1 second to 1440 minutes. Any system variables (inputs, outputs, math calculations, flags, etc.) can be logged in history. A maximum of 32767 values can be stored in each log. Each log can record either the instantaneous, average, minimum or maximum value of the point. Logs can be automatic or manual. Logged data shall be downloadable to the Operator Workstation for long term archiving based upon user-defined time intervals, or manual command.

O. Alarm Management: For each system point, alarms can be created based on high/low limits or conditional expressions. All alarms will be tested each scan of the NCU and can result in the display of one or more alarm messages or reports.

P. Up to 8 alarms can be configured for each point in the controller.

Q. Messages and reports can be sent to a local terminal, to the front-end workstation(s), or via modem to a remote-computing device.

R. Alarms will be generated based on their priority. A minimum of 255 priority levels shall be provided: If communication with the Operator Workstation is temporarily interrupted, the alarm will be buffered in the NCU. When communications return, the alarm will be transmitted to the Operator Workstation if the point is still in the alarm condition.

S. Reporting: The NCU shall be able to generate user-definable reports to a locally connected printer or terminal. The reports shall contain any combination of text and system variables. Report templates shall be able to be created by users in a word processing environment. Reports can be displayed based on any logical condition or through a user command.

2.03 STANDALONE DIGITAL CONTROL UNITS (SDCUs)

A. General: Standalone Digital Control Units shall provide control of HVAC and lighting. Each controller shall have its own control programs and will continue to operate in the event of a failure or communication loss to its associated NCU.

B. Memory: Control programs shall be stored in battery backed-up RAM and EPROM. Each controller shall have a minimum of 128K bytes of user RAM memory and 128K bytes of EPROM.

C. Communication Ports: SDCUs shall provide a communication port to the field bus. In addition, a port shall be provided for connection of a portable service tool to support local commissioning and parameter changes with or without the NCU online. It shall be possible from a service port on any SDCU to view, enable/disable, and modify values of any point or program on any controller on the local field bus, any NCU or any SDCU on a different field bus.

D. Input/Output:
   1. Each SDCU shall support the addition of the following types of inputs and outputs:
      a. Digital Inputs for status/alarm contacts.
      b. Counter Inputs for summing pulses from meters.
      c. Thermistor Inputs for measuring temperatures in space, ducts and thermowells.
      d. Analog inputs for pressure, humidity, flow and position measurements.
      e. Digital Outputs for on/off equipment control.
      f. Analog Outputs for valve and damper position control, and capacity control of primary equipment.

E. Expandability: Input and output capacity shall be expandable through the use of plug-in modules. A minimum of two modules shall be added to the base SDCU before additional power is required.
F. Networking: Each SDCU will be able to exchange information on a peer-to-peer basis with other Standalone Digital Control Units during each field bus scan. Each SDCU shall be capable of storing and referencing global variables (on the LAN) with or without any workstations online. Each SDCU shall be able to have its program viewed and/or enabled/disabled either locally through a portable service tool or through a workstation connected to an NCU.

G. Indicator Lamps: SDCUs will have as a minimum, LED indication of CPU status, and field bus status.

H. Real Time Clock (RTC): An SDCU shall have a real time clock in either hardware or software. The accuracy shall be within 10 seconds per day. The RTC shall provide the following information: time of day, day, month, year, and day of week. Each SDCU shall receive a signal, every hour, over the network from the NCU, which synchronizes all SDCU real time clocks.

I. Automatic Restart after Power Failure: Upon restoration of power, the SDCU shall automatically and without human intervention, update all monitored functions, resume operation based on current, synchronized time and status, and implement special start-up strategies as required.

J. Battery Back Up: Each SDCU shall have at least 3 years of battery back up to maintain all volatile memory.

K. Alarm Management:
   1. For each system point, alarms can be created based on high/low limits or conditional expressions. All alarms will be tested each scan of the SDCU and can result in the display of one or more alarm messages or reports.
   2. Up to 8 alarms can be configured for each point in the controller enabling the escalation of the alarm priority (urgency) based upon which alarm(s) is/are triggered.
   3. Alarm messages can be sent to a local terminal or modem connected to an NCU or to the Operator’s Workstation(s).
   4. Alarms will be generated based on their priority. A minimum of 255 priority levels shall be provided.
   5. If communication with the NCU is temporarily interrupted, the alarm will be buffered in the SDCU. When communications return, the alarm will be transmitted to the NCU if the point is still in the alarm condition.

L. Air Handler unit, chiller, pumps, cooling and tower controller.
   1. The controllers shall be capable of meeting the requirements of the sequence of operation as indicated on the control drawings.

M. Display Controllers
   1. Display controllers are standalone, touch screen based operator interfaces. The controller shall be designed for flush mounting in a finished space, with a minimum display size of 9 x 9 inches.
   2. Software shall be user programmable allowing for custom graphical images that simulate floor plans, menus, equipment schematics along with associated real time point values coming from any NCU on the network.
   3. The touch screen display shall contain a minimum of 64 possible touch cells that permit user interaction for changing screens, modifying setpoints or operating equipment.
   4. Systems that do not offer a display controller as specified must provide a panel mounted computer with touch screen capability as an alternative.
2.04 OPERATOR WORKSTATION REQUIREMENTS (existing LAN System) Workstation and Server are not added to this project. However all controllers will be added to the existing BACnet and LAN system.

A. General.

1. The BAS workstation software shall be configurable as either a single workstation system (with a local database) or multi-workstation system where the database is located on a central file server. The client software on multi-workstation system shall access the file server database program via an Ethernet TCP/IP network running at either 10MBPS or 100MBPS.

2. New Workstation shall be:

<table>
<thead>
<tr>
<th>PROCESSOR</th>
<th>Intel® Core™ i5 Processor 680 with VT (3.60GHz, 4M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPERATING SYSTEM</td>
<td>Windows 7 Professional</td>
</tr>
<tr>
<td>WARRANTY &amp; SERVICE</td>
<td>3 Year ProSupport and 3 Year NBD Onsite Service</td>
</tr>
<tr>
<td>SYSTEMS MANAGEMENT MODE</td>
<td>Intel Core i7/i5 vPro Technology Enabled</td>
</tr>
<tr>
<td>MEMORY</td>
<td>4GB DDR3 Non-ECC SDRAM, 1333MHz, (2 DIMM)</td>
</tr>
<tr>
<td>HARD DRIVE</td>
<td>500GB 2.5 SATA 3.0Gb/s and 16MB DataBurst Cache™</td>
</tr>
<tr>
<td>OPTICAL DRIVE</td>
<td>16X DVD+/-RW SATA, Roxio Creator™ Cyberlink PowerDVD™</td>
</tr>
<tr>
<td>VIDEO CARD</td>
<td>Integrated Intel® Graphics Media Accelerator HD, DisplayPort/ VGA</td>
</tr>
<tr>
<td>MONITOR</td>
<td>Dell UltraSharp™ 2007FP 20in HAS Monitor, VGA/ DVI</td>
</tr>
<tr>
<td>ENERGY SMART</td>
<td>Dell Energy Smart Enable (ESMART)</td>
</tr>
<tr>
<td>FILE SYSTEM</td>
<td>NTFS File System for all Operating Systems</td>
</tr>
<tr>
<td>SYSTEM DOCUMENTATION</td>
<td>Resource DVD contains Diagnostics and Driver for Dell OptiPlex System</td>
</tr>
<tr>
<td>KEYBOARD</td>
<td>Dell Multimedia Pro Keyboard, English</td>
</tr>
<tr>
<td>MOUSE</td>
<td>Dell MS111 USB Optical Mouse</td>
</tr>
</tbody>
</table>

*The application software shall be capable of communication to all Network Control Units and Standalone Digital Control Units, feature high-resolution color graphics, alarming, reporting, and be user configurable for all data collection and data presentation functions.

3. For multi-workstation systems, a minimum of 256 workstations shall be allowed on the
Ethernet network along with the central file server. In this client/server configuration, any changes or additions made from one workstation will automatically appear on all other workstations without the requirement for manual copying of files. Multi-workstation systems with no central database will not be acceptable. Multi-workstation systems with distributed/tiered file servers and a central (master) database will be acceptable.

B. Workstation Software

1. General Description:
   a. The software architecture must be object-oriented in design, a true 32-bit application suite utilizing Microsoft’s OLE, COM, DCOM and ODBC technologies. These technologies make it easy to fully utilize the power of the operating system to share, among applications (and therefore to the users of those applications), the wealth of data available from the BAS.

   b. The workstation functions shall include monitoring and programming of all DDC controllers. Monitoring consists of alarming, reporting, graphic displays, long-term data storage, automatic data collection, and operator-initiated control actions such as schedule and setpoint adjustments.

   c. Programming of controllers shall be capable of being done either off-line or online from any operator workstation. All information will be available in graphic or text displays. Graphic displays will feature animation effects to enhance the presentation of the data, to alert operators of problems, and to facilitate location of information throughout the DDC system. All operator functions shall be selectable through a mouse.

C. System Database: The files server database engine must be Microsoft SQL Server (depending on Continuum version). This ODBC (Open Database Connectivity) compliant database engine allows for an owner to utilize “their” choice of database and due to its “open” architecture, allows an owner to write custom applications and/or reports which communicate directly with the database avoiding data transfer routines to update other applications. The system database shall contain all point configurations and programs in each of the controllers that have been assigned to the network. In addition, the database will contain all workstation files including alarm reports, text reports, historical data logs, schedules, and polling records.

1. New Workstation shall be:

<table>
<thead>
<tr>
<th>PRIMARY PROCESSOR</th>
<th>Intel® Xeon® E5620 2.4Ghz, 12M Cache, Turbo, HT, 1066MHz Max Mem</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEMORY</td>
<td>8GB Memory (4x2GB), 1333MHz 1R LV UDIMMs for 1 Processor, Advanced ECC</td>
</tr>
<tr>
<td>SYSTEMS MANAGEMENT MODE</td>
<td>Intel Core i7/i5 vPro Technology Enabled</td>
</tr>
<tr>
<td>OPERATING SYSTEM</td>
<td>Windows Server 2008 R2, Standard Edition, x64, Includes 5 CALS</td>
</tr>
<tr>
<td>HARD DRIVE CONFIGURATION</td>
<td>RAID 1 for H700, PERC 6/i, H200 or SAS 6/iR Controllers</td>
</tr>
<tr>
<td>INTERNAL CONTROLLER</td>
<td>PERC H200 Integrated RAID Controller</td>
</tr>
<tr>
<td>HARD DRIVES</td>
<td>500GB 7.2K RPM SATA 2.5-in HotPlug Hard Drive</td>
</tr>
<tr>
<td>MICROSOFT SQL SERVER</td>
<td>Microsoft® SQL Server™ 2008 R2 Workgroup w/ 5 CALs, OEM, NFI, w/Media</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>NETWORK ADAPTER</td>
<td>Broadcom 5709 Dual Port 1GbE NIC w/ TOE iSCSI, PCIe-4</td>
</tr>
<tr>
<td>EMBEDDED MANAGEMENT</td>
<td>iDRAC6 Express</td>
</tr>
<tr>
<td>INTERNAL OPTICAL DRIVE</td>
<td>DVD+/-RW, SATA, Internal</td>
</tr>
<tr>
<td>SERVER ACCESSORIES</td>
<td>Keyboard and Optical Mouse, USB, Black, English, with 17 LCD Monitor</td>
</tr>
<tr>
<td>SYSTEM DOCUMENTATION</td>
<td>Electronic System Doc, OpenManage DVD Kit with Dell Management Console</td>
</tr>
<tr>
<td>HARDWARE SERVICES SUPPORT</td>
<td>3 Year ProSupport and Mission Critical 4HR 7x24 Onsite Pack</td>
</tr>
</tbody>
</table>

D. User Interface: The BAS workstation software shall allow the creation of a custom, browser-style interface linked to the user that has logged into the workstation software. This interface shall support the creation of “hot-spots” that the user may link to view/edit any object in the system or run any object editor or configuration tool contained in the software. Furthermore, this interface must be able to be configured to become a user’s “PC Desktop” – with all the links that a user needs to run other applications. This, along with the Windows NT user security capabilities, will enable a system administrator to setup workstation accounts that not only limit the capabilities of the user within the BAS software but may also limit what a user can do on the PC and/or LAN/WAN. This might be used to ensure, for example, that the user of an alarm monitoring workstation is unable to shutdown the active alarm viewer and/or unable to load software onto the PC.

E. User Security: The software shall be designed so that each user of the software can have a unique username and password. This username/password combination shall be linked to a set of capabilities within the software, set by and editable only by, a system administrator. The sets of capabilities shall range from View only, Acknowledge alarms, Enable/disable and change values, Program, and Administer. The system shall allow the above capabilities to be applied independently to each and every class of object in the system. The system must allow a minimum of 256 users to be configured per workstation. There shall be an inactivity timer adjustable in software that automatically logs off the current operator after the timer has expired.

F. Configuration Interface:

1. The workstation software shall use a familiar Windows Explorer™-style interface for an operator or programmer to view and/or edit any object (controller, point, alarm, report, schedule, etc.) in the entire system. In addition, this interface shall present a “network map” of all controllers and their associated points, programs, graphics, alarms, and reports in an easy to understand structure. All object names shall be alphanumeric and use Windows long filename conventions. Object names shall not be required to be unique throughout the system. This allows consistency in point naming. For example, each AHU controller can have an input called Space Temperature and a setpoint called CFM Setpoint. The AHU controller name shall be unique such as AHU for LAB101. Systems requiring unique object names throughout the system will not be acceptable.
2. The configuration interface shall also include support for template objects. These template objects shall be used as building blocks for the creation of the BAS database. The types of template objects supported shall include all data point types (input, output, string variables, setpoints, etc.), alarm algorithms, alarm notification objects, reports, graphics displays, schedules, and programs. Groups of template object types shall be able to be set up as template subsystems and systems. The template system shall prompt for data entry if necessary. The template system shall maintain a link to all "child" objects created by each template. If a user wishes to make a change to a template object, the software shall ask the user if he/she wants to update all of child objects with the change. This template system shall facilitate configuration and programming consistency and afford the user a fast and simple method to make global changes to the BAS.

G. Color Graphic Displays

1. The system shall allow for the creation of user defined, color graphic displays for the viewing of mechanical and electrical systems, or building schematics. These graphics shall contain point information from the database including any attributes associated with the point (engineering units, etc.). In addition operators shall be able to command equipment or change setpoints from a graphic through the use of the mouse. Requirements of the color graphic subsystem include:
   a. SVGA, bit-mapped displays. The user shall have the ability to import AutoCAD generated picture files as background displays.
   b. A built-in library of animated objects such as dampers, fans, pumps, buttons, knobs, gauges, ad graphs which can be "dropped" on a graphic through the use of a software configuration "wizard". These objects shall enable operators to interact with the graphic displays in a manner that mimics their mechanical equivalents found on field installed control panels. Using the mouse, operators shall be able to adjust setpoints, start or stop equipment, modify PID loop parameters, or change schedules.
   c. Status changes or alarm conditions must be able to be highlighted by objects changing screen location, size, color, and text, blinking or changing from one display to another.
   d. Graphic panel objects shall be able to be configured with multiple "tabbed" pages allowing an operator to quickly view individual graphics of equipment, which make up a subsystem or system.
   e. Ability to link graphic displays through user-defined objects; alarm testing, or the result of a mathematical expression.
   f. Operators must be able to change from one graphic to another by selecting an object with a mouse - no menus will be required.
   g. Control contractor shall be responsible to coordinate with District facility department in advance for color system graphic to match the existing systems.

H. Alarm Management

1. The software shall be capable of accepting alarms directly from controllers, or generating alarms based on evaluation of data in controllers and comparing to limits or conditional equations configured through the software. Any alarm (regardless of its origination) will be integrated into the overall alarm management system and will appear in all standard alarm reports, be available for operator acknowledgment, and have the option for displaying graphics, or reports.

2. Alarm management features shall include:
   a. A minimum of 255 alarm notification levels. Each notification level will establish a
unique set of parameters for controlling alarm display, acknowledgment, keyboard
annunciation, alarm printout and record keeping.

b. Automatic logging in the database of the alarm message, point name, point value,
connected controller, timestamp, username and time of acknowledgement,
username and time of alarm silence (soft acknowledgement)
c. Automatic printing of the alarm information or alarm report to an alarm printer or
report printer.
d. Playing an audible beep or audio (wav) file on alarm initiation or return too normal.
e. Sending an email or alphanumeric page to anyone listed in a workstation’s email
account address list on either the initial occurrence of an alarm and/or if the alarm
is repeated because an operator has not acknowledged the alarm within a user-
configurable timeframe. The ability to utilize email and alphanumeric paging of
alarms shall be a standard feature of the software integrated with the operating
system’s mail application interface (MAPI). No special software interfaces shall be
required.
f. Individual alarms shall be able to be re-routed to a workstation or workstations at
user-specified times and dates. For example, a critical high temp alarm can be
configured to be routed to a Facilities Dept. workstation during normal working
hours (7am-6pm, Mon-Fri) and to a Central Alarming workstation at all other times.
g. An active alarm viewer shall be included which can be customized for each user or
user type to hide or display any alarm attributes.
h. The font type and color, and background color for each alarm notification level as
seen in the active alarm viewer shall be customizable to allow easy identification of
certain alarm types or alarm states.
i. The active alarm viewer can be configured such that an operator must type in text
in an alarm entry and/or pick from a drop-down list of user actions for certain
alarms. This ensures accountability (audit trail) for the response to critical alarms.

I. Scheduling

1. It shall be possible to configure and download from the workstation schedules for any
of the controllers on the network.

2. Time of day schedules shall be in a calendar style and shall be programmable for a
minimum of one year in advance and to match the existing campus scheduling. Each
standard day of the week and user-defined day types shall be able to be associated
with a color so that when the schedule is viewed it is very easy, at-a-glance, to
determine the schedule for a particular day even from the yearly view. To change the
schedule for a particular day, a user shall simply click on the day and then click on the
day type.

3. Each schedule will appear on the screen viewable as the entire year, monthly, week
and day. A simple mouse click shall allow switching between views. It shall also be
possible to scroll from one month to the next and view or alter any of the schedule
times.

4. Schedules will be assigned to specific controllers and stored in their local RAM
memory. Any changes made at the workstation will be automatically updated to the
corresponding schedule in the controller.

J. Programmer's Environment: The programmer's environment will include access to a
superset of the same programming language supported in the controllers. Here the
programmer will be able to configure application software off-line (if desired) for custom
program development, write global control programs, system reports, wide area networking
data collection routines, and custom alarm management software. On the same screen as the program editor, the programming environment shall include dockable debug and watch bars for program debugging and viewing updated values and point attributes during programming. In addition a wizard tool shall be available for loading programs from a library file in the program editor.

K. Saving/Reloading: The workstation software shall have an application to save and restore field controller memory files. This application shall not be limited to saving and reloading an entire controller – it must also be able to save/reload individual objects in the controller. This allows off-line debugging of control programs, for example, and then reloading of just the modified information.

L. Data Logging: The workstation software shall have the capability to easily configure groups of data points with trend logs and display the trend log data. A group of data points shall be created by drag-and-drop method of the points into a folder. The trend log data shall be displayed through a simply menu selection. This data shall be able to be saved to file and/or printed.

M. Audit Trail: The workstation software shall automatically log and timestamp every operation that a user performs at a workstation, from logging on and off a workstation to changing a point value, modifying a program, enabling/disabling an object, viewing a graphic display, running a report, modifying a schedule, etc.

N. Fault Tolerant File Server Operation:
1. The system shall provide the option to provide fault tolerant operation in the event of the loss of the CPU, disk drives, or other hardware required to maintain the operational integrity of the system. Operational integrity includes all user interfaces, monitoring of alarm points and access points, and executing access control functions.

2. The switchover mechanism provided shall be automatic. Should the failure be caused by hardware, and then the system shall immediately switch to the Backup computer. Should the system failure be caused by software (instruction or data), the system shall not pass the faulted code to the Backup computer, otherwise the Backup shall fail in the same manner of the Primary computer.

3. Switchover to the Backup computer shall be initiated and effective (complete) in a manner and time frame that precludes the loss of event data, and shall be transparent to the system users, except for an advisory alarm message indicating that the switchover has occurred.

4. When the system fails-over from the Primary to the Backup computer, no alarm or other event shall be lost, and the Backup computer shall take control of all system functions.

5. A single component failure in the system shall not cause the entire system to fail. All system users shall be informed of any detectable component failure via an alarm event. System users shall not be logged off as a result of a system failure or switchover.

6. The Primary computer shall provide continual indication that the Backup computer is unavailable until such time that the fault has been purged.

7. Full screen, laptop service tools shall communicate directly to all controllers. The laptop software shall enable users to monitor both instantaneous and historical point data, modify control parameters, and enable/disable any point or program in any controller on the network.

O. Temperature Sensors
1. All temperature devices shall use precision thermistors accurate to +/- 1 degree F over a range of –30 to 230 degrees F. Space temperature sensors shall be accurate to +/- .5
degrees F over a range of 40 to 100 degrees F.

a. Zone Sensors- Andover Model Number: TTS-SD-LCD-1
b. Duct Sensors- Andover TT-D Series, Veris TJ Series, or equivalent
c. Well Sensors- Andover TT-I Series

2. Standard space sensors shall be available in an off white enclosure for mounting on a standard electrical box.

3. Where manual overrides are required, the sensor housing shall feature both an optional Sliding mechanism for adjusting the space temperature setpoint, as well as a push button for selecting after hours operation.

4. Where a local display is specified, the sensor shall incorporate either an LCD display for viewing the space temperature, setpoint and other operator selectable parameters. Using built in buttons, operators shall be able to adjust setpoints directly from the sensor.

5. Duct temperature sensors shall incorporate a thermistor bead embedded at the tip of a stainless steel tube. Probe style duct sensors are useable in air handling applications where the coil or duct area is less than 14 square feet.

6. Averaging sensors shall be employed in ducts, which are larger than 14 square feet. The averaging sensor tube must contain at least one thermistor for every 3 feet, with a minimum tube length of 12 feet.

7. Immersion sensors shall be employed for measurement of temperature in all chilled and hot water applications as well as refrigerant applications. Thermal wells shall be brass or stainless steel for non-corrosive fluids below 250 degrees F and 300 series stainless steel for all other applications.

8. A pneumatic signal shall not be allowed for sensing temperature.

P. Humidity Sensors

1. Humidity devices shall be accurate to +/- 5% at full scale for space and +/- 3% for duct and outside air applications. Provide Minco or Setra.

2. Provide a hand held field calibration tool that both reads the output of the sensor and contains a reference sensor for ongoing calibration.

Q. Pressure Sensors

1. Air pressure measurements in the range of 0 to 10” water column will be accurate to +/- 1 percent using a solid-state sensing element. Acceptable manufacturers include Setra and Dwyer.

2. Differential pressure measurements of liquids or gases shall be accurate to +/- 0.5% of range. The housing shall be Nema 4 rated. Acceptable manufacturers include Setra and Dwyer.

R. Current and KW Sensors

1. Current status switches shall be used to monitor fans, pumps, motors and electrical loads. Current switches shall be available in solid core models, and offer either a digital or an analog signal to the automation system. Acceptable manufacturer is Veris or approved equal.

2. Measurement of three-phase power shall be accomplished with a kW/kWH transducer. This device shall utilize direct current transformer inputs to calculate the instantaneous value (kW) and a pulsed output proportional to the energy usage (kWh). Provide Veris Model 6000 Power Transducer or approved equal.
S. Flow Sensors
   1. Provide an insertion flowmeter for measurement of liquid; gas or steam flows in pipe sizes above 3 inches.
   2. Install the flow meter on an isolation valve to permit removal without process shutdown.
   3. Sensors shall be manufactured by ONICON, Badger, or approved equal.

T. Electric/Pneumatic Transducers
   1. Electric to pneumatic transducers shall operate from an analog signal. E/P transducers shall be rated for 0 - 20 psi operation and accurate to 2% of full scale. E/P transducers shall have a maximum air consumption of 100 SCIM.
   2. E/P transducers may be installed at the end device (damper or valve), or mounted separately in a field interface panel, or in the control panel. All transducers will be calibrated. Panel mounted transducers shall be Mamac or approved equal.

U. Electric/Pneumatic Solenoid Valves: Electric solenoid operated pneumatic valves (EP's) shall have a three-port operation: common, normally open and normally closed. They shall be rated for 50 psig when used for 25 psig or less applications, or rated for 150 psig when used for 100 psig or less applications. The coils shall be equipped with transient suppression devices to limit transients to 150 percent of the rated coil voltage.

2.05 CONTROL VALVES

A. Provide automatic control valves suitable for the specified controlled media (Hot and Chilled Water). Provide valves, which mate and are compatible with the material of the connected piping. Equip control valves with the actuators of required input power type and control signal type to accurately position the flow control element and provide sufficient force to achieve required leakage specification. Control valves to be DuraDrive or equivalent.

B. Contractor to size valve Cv so that differential pressure at rated flow is between 3 to 5 psig for Chilled Water and 2 to 3.5 psig for Hot Water.

C. Control valves shall meet the heating and cooling loads specified, and close off against the differential pressure conditions within the application. Valves should be sized to operate accurately and with stability from 10 to 100% of the maximum design flow.

D. Electric actuation should be provided on all terminal unit reheat applications.

E. The actuator shall be direct coupled over the shaft, enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The actuator shall have electronic overload circuitry to prevent damage. For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing. Non-spring return actuators shall have an external manual gear release to allow positioning of the damper when the actuator is not powered. Actuators to be DuraDrive or equivalent.

2.06 SMOKE DETECTORS

A. Smoke detector to be furnished and wired by Division 16, installed by Division 15.–Smoke Detector – Robertshaw Model Number: 2650-450
PART 3 EXECUTION

3.01 CONTRACTOR RESPONSIBILITIES

A. General: The BAS system is to be furnished and installed by an Andover approved Contractor. The Contractor shall certify all work as proper and complete. Under no circumstances shall the design; scheduling, coordination, interface with the existing controller programming, training, and warranty requirements for the project are delegated to a subcontractor.

B. Access to Site: Unless notified otherwise, entrance to building is restricted. No one will be permitted to enter the building unless their names have been cleared with the Owner or the Owner’s Representative.

C. Code Compliance: All wiring shall be installed in accordance with all applicable electrical codes and will comply with equipment manufacturer’s recommendations. Should any discrepancy be found between wiring specifications in Division 15900 and Division 16, wiring requirements of Division 15900 will prevail for work specified in Division 17.

D. Cleanup: At the completion of the work, all equipment pertinent to this contract shall be checked and thoroughly cleaned, and all other areas shall be cleaned around equipment provided under this contract. Clean the exposed surfaces of tubing, hangers, and other exposed metal of grease, plaster, or other foreign materials.

3.02 WIRING, CONDUIT, TUBING AND CABLE

All wire will be copper and meet the minimum wire size and insulation class listed below:

<table>
<thead>
<tr>
<th>Wire Class</th>
<th>Wire Size</th>
<th>Isolation Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>12 Gauge</td>
<td>600 Volt</td>
</tr>
<tr>
<td>Class Two</td>
<td>14 Gauge Std.</td>
<td>600 Volt</td>
</tr>
<tr>
<td>Class Two</td>
<td>18 Gauge Std.</td>
<td>300 Volt</td>
</tr>
<tr>
<td>Class Two</td>
<td>18 Gauge Std.</td>
<td>300 Volt</td>
</tr>
<tr>
<td>Communications</td>
<td>Per Mfr.</td>
<td>Per Mfr.</td>
</tr>
</tbody>
</table>

A. Power and Class One wiring may be run in the same conduit. Class Two and Three wiring and communications wiring may be run in the same conduit.

B. Where different wiring classes terminate within the same enclosure, maintain clearances and install barriers per the National Electric Code.

C. Where wiring shall to be installed in the conduit in mechanical rooms and exterior EMT shall be used. Conduit shall be minimum 1/2 inch galvanized EMT. Setscrew fittings are acceptable for dry interior locations. Watertight compression fittings shall be used for exterior locations and interior locations subject to moisture. Provide conduit seal off fitting where exterior conduits enter the building or between areas of high temperature/moisture differential.

D. Where the space above the ceiling is a supply or return air plenum, the wiring shall be plenum rated cable. Plenum rated cable can be run without conduit above suspended ceilings. Cabling shall be installed in conduit systems in mechanical and electrical rooms.

E. Flexible metallic conduit (max. 3 feet) shall be used for connections to motors, actuators, controllers, and sensors mounted on vibration producing equipment. Liquid-tight flexible conduit shall be use in exterior locations and interior locations subject to moisture.

F. Junction boxes shall be provided at all cable splices, equipment termination, and transitions from EMT to flexible conduit. Interior dry location J-boxes shall be galvanized pressed steel,
nominal four-inch square with blank cover. Exterior and damp location JH-boxes shall be cast alloy FS boxes with threaded hubs and gasketed covers.

G. Pneumatic tubing will be FR rated polyethylene instrumentation tubing, type M, hard copper tubing, or soft copper tubing. All pneumatic tubing will be sized for a maximum pressure drop of 2 PSI from the pressure-reducing valve to end device.

H. Coaxial cable shall conform to RG62 or RG59 rating. Provide plenum rated coaxial cable when running in return air plenums.

I. Fiber optic cable shall include the following sizes; 50/125, 62.5/125 or 100/140: Only glass fiber is acceptable, no plastic.

J. Fiber optic cable shall only be installed and terminated by an experienced contractor. The BAS contractor shall submit to the Engineer the name of the intended contractor of the fiber optic cable with his submittal documents.

3.03 HARDWARE INSTALLATION

A. Installation Practices for Wiring and Tubing

1. All controllers are to be mounted vertically and per the manufacturer’s installation documentation.

2. A true earth ground must be available in the building. Do not use a corroded or galvanized pipe, or structural steel. Conduit in finished areas will be concealed in furred spaces and wall construction. Exception; metallic surface raceway may be used in finished areas on masonry walls. All surface raceway in finished areas must be color matched to the existing finish within the limitations of standard manufactured colors.

3. Conduit, in non-finished areas where possible, will be concealed in furred spaces, and wall construction. Exposed conduit will run parallel to or at right angles to the building structure.

4. Wires are to be kept a minimum of three (3) inches from hot water, steam, or condensate piping.

5. Where sensor wires leave the conduit system, they are to be protected by a plastic insert.

6. Wire or pneumatic tubing will not be allowed to run across telephone equipment areas.

7. All wiring running down exposed fire rated walls to controls or control panels shall be run in EMT or completely enclosed in metal raceways.

8. All control wiring in concrete walls or floors shall run in rigid conduit.

B. Installation Practices for Field Devices

1. Well-mounted sensors will include thermal conducting compound within the well to insure good heat transfer to the sensor.

2. Actuators will be firmly mounted to give positive movement and linkage will be adjusted to give smooth continuous movement throughout 100 percent of the stroke.

3. Waterline mounted sensors shall be removable without shutting down the system in which they are installed.

4. For duct static pressure sensors, the high-pressure port shall be connected to a metal static pressure probe inserted into the duct pointing upstream. The low-pressure port shall be left open to the plenum area at the point that the high-pressure port is tapped into the ductwork.
5. For building static pressure sensors, the high-pressure port shall be inserted into the space via a metal tube. Pipe the low-pressure port to the outside of the building.

C. Enclosures

1. For all I/O requiring field interface devices, these devices where practical will be mounted in a field interface panel (FIP). The Contractor shall provide an enclosure, which protects the device(s) from dust, moisture, conceals integral wiring and moving parts.

2. FIPs shall contain power supplies for sensors, interface relays and contactors, safety circuits, and I/P transducers.

3. The FIP enclosure shall be of steel construction with baked enamel finish, NEMA 1 rated with a hinged door and keyed lock. The enclosure will be sized for twenty percent spare mounting space. All locks will be keyed identically.

4. All wiring to and from the FIP will be to screw type terminals. Analog or communications wiring may use the FIP as a raceway without terminating. The use of wire nuts on control signal wires within the FIP is prohibited.

5. All outside mounted enclosures shall meet the NEMA-4 rating.

6. The tubing and wiring within all enclosures shall be run in plastic track. Wiring within controllers shall be wrapped and secured.

D. Identification

1. Identify all control wires with labeling tape or sleeves using words, letters, or numbers that can be exactly cross-referenced with as-built drawings.

2. Identify all pneumatic tubing with labeling tape or sleeves using words, letters, or numbers that can be exactly cross-referenced with as-built drawings.

3. All field enclosures, other than controllers, shall be identified with a Bakelite nameplate. The lettering shall be in white against a black or blue background.

4. Junction box covers will be marked to indicate that they are a part of the BAS system.

5. All I/O field devices (except space sensors) that are not mounted within FIP's shall be identified with nameplates.

6. All I/O field devices inside FIP's shall be labeled.

E. Location

1. The location of sensors is per mechanical and architectural drawings.

2. Space humidity or temperature sensors will be mounted away from machinery generating heat, direct light and diffuser air streams.

3. Outdoor air sensors will be mounted on the north building face directly in the outside air. Install these sensors such that the effects of heat radiated from the building or sunlight is minimized.

4. Field enclosures shall be located immediately adjacent to the controller panel(s) to which it is being interfaced

3.04 SOFTWARE INSTALLATION

A. General: The software design and implementation is to be facilitated only by an Andover approved Contractor. The Contractor shall provide all labor necessary to install, initialize, start-up and debug all system software as described in this section. This includes any operating system software or other third party software necessary for successful operation of the system.
B. Database Configuration: The Contractor will provide all labor to configure those portions of the database that are required by the point's list and sequence of operation.

C. Color Graphic Slides:
   1. Unless otherwise directed by the owner, the Contractor will provide color graphic displays matching the Campus Standards for each system and floor plan.
   2. For each system or floor plan, the display shall contain the associated points identified in the point list and allow for setpoint changes as required by the owner.
      a. Animations and 3D Rendering.
      b. Animations to mimic all moving devised, status and operation.
      c. Animations set to maximum performance, compatible with Version 1.81.
      d. Individual slides; mechanical equipment, VAV/CAV boxes, pumps, motors, fans, dampers, thermostats, and valves.

D. Reports
   1. The Contractor will configure a minimum of 6 reports for the owner as listed below:
      b. VAV Status Report.

E. Documentation
   1. As built software documentation will include the following:
      a. Descriptive point lists.
      b. Application program listing.
      c. Application programs with comments.
      d. Printouts of all reports.
      e. Alarm list.
      f. Printouts of all graphics.

3.05 COMMISSIONING AND SYSTEM STARTUP

A. Point to Point Checkout: Each I/O device (both field mounted as well as those located in FIPs) shall be inspected and verified for proper installation and functionality. A checkout sheet itemizing each device shall be filled out, dated and approved by the Facilities Manager for submission to the owner’s representative.

B. Controller and Workstation Checkout: A field checkout of all controllers and front-end equipment (computers, printers, modems, etc.) shall be conducted to verify proper operation of both hardware and software. A checkout sheet itemizing each device and a description of the associated tests shall be prepared and submitted to the owner or owner’s representative by the completion of the project.

C. System Acceptance Testing
   1. All application software will be verified and compared against the sequences of operation. Control loops will be exercised by inducing a setpoint shift of at least 10% and observing whether the system successfully returns the process variable to setpoint. Record all test results and attach to the Test Results Sheet.
2. Test each alarm in the system and validate that the system generates the appropriate alarm message, that the message appears at all prescribed destinations (workstations or printers), and that any other related actions occur as defined (i.e. graphic panels are invoked, reports are generated, etc.). Submit a Test Results Sheet to the owner.

3. Perform an operational test of each unique graphic display and report to verify that the item exists, that the appearance and content are correct, and that any special features work as intended. Submit a Test Results Sheet to the owner.

4. Perform an operational test of each third party interface that has been included as part of the automation system. Verify that all points are properly polled, that alarms have been configured, and that any associated graphics and reports have been completed. If the interface involves a file transfer over Ethernet, test any logic that controls the transmission of the file, and verify the content of the specified information.

END OF SECTION
SCOPE OF WORK

ADD ALTERNATE #1 - The contractor shall provide a separate line item cost (refer to Bid Proposal Form 00300) clearly indicating all costs for providing two equally sized boilers in lieu of a single boiler. The basic infrastructure (secondary pump with variable frequency drive, air separator, chemical pot feeder, industrial cold water make-up and expansion tank) shall remain the same regardless of the implementation of the base bid (a single boiler) or Add Alternate #1.

Provide written back-up outlining all of the new requirements resulting from changing from a single boiler to two equally sized boilers totaling the same capacity as the single boiler system.

The Add Alternate (Refer to Drawing MP2.1A) shall include the following modifications, at a minimum, above the system requirements of the single boiler system:

1. Two boilers each provided with their own primary pump;
2. Controls required to allow the two boilers to operate in unison.
3. Modified products of combustion vent to accommodate two boilers.
4. Modified piping system to accommodate two boilers.
5. Provide a manual butterfly valve at the inlet to each boiler. These valves can later be converted to automatic control valves by replacing the actuator in the event the system gets converted to a lead/lag system in the future with a single boiler handling the load until the heat losses are too high for the single boiler to overcome.
PHASING NOTES:

STAGE 3: (SHALL OCCUR CONCURRENTLY WITH STAGE 1 OR STAGE 2)

A. PLACE TEMPORARY PACKAGED AIR-CONDITIONING UNIT (ALONG WITH ASSOCIATED SENSORS AND CONTROLS) IN DESIGNATED LOCATION. UNIT SHALL USE 100% OUTSIDE AIR. CONTRACTOR TO PROVIDE SUPPLY AIR DUCTWORK. CONTRACTOR TO PROVIDE TEMPORARY POWER FOR AC UNIT.

STAGE 6:

A. AFTER INSTALLATION AND OPERATION OF THE NEW SYSTEM, CONTRACTOR SHALL REMOVE TEMPORARY AIR-COoled CHILLER, BOILER, AIR-HANDLING UNIT, AND ASSOCIATED PUMPS, SENSORS, VALVES, CONTROLS, DUCTWORK AND ALL PIPING.

B. PROVIDE TEMPORARY PUMP FOR FLUSHING THE CHILLED, HEATING, AND CONDENSER WATER SYSTEM. CONTRACTOR SHALL COORDINATE WITH ELECTRICAL CONTRACTOR TO PROVIDE POWER TO THE TEMP. PUMP.

C. PROVIDE TEMPORARY BY-PASS AT THE END OF EACH SYSTEM DURING THE FLUSHING AND CLEANING. SEE DETAIL 1

DETAIL 1 TEMP BYPASS

SUPPLY LINE

RETURN LINE

SOV FLANGE

SOV FLANGE

TEMP BYPASS, SAME SIZE OF PIPE

Date Signed
(N) CHEMICAL TREATMENT SYSTEM WITH CONTROL PANEL.
1"ICW TO MAKE-UP WATER
1"DCW TO MAKE-UP WATER

CT 1

AIR COMP. & TANK

TO 1"DCW P.O.C
TO 1"ICW

WATER HEATER

AIR SEPARATOR
SEE DETAIL 3/MB.1

1"DCW TO MAKE-UP WATER
1"ICW TO MAKE-UP WATER

CHWP 1

SHEET NOTES:

FEBCO LF825Y BACKFLOW PREVENTER (OR EQUAL)
COOLING TOWER ENCLOSURE

SCALE: 1/2" = 1' - 0"

2" DRAIN/ OVERFLOW TO FLOOR SINK

6" CWP 1

TO/FROM CHEMICAL TREATMENT

(N) PX

(n) CONTROL PANEL

(N) CHEMICAL TREATMENT

(E) XFMR

(N) 4" CT DRAIN

(E) DRAIN

(n) SWITCH BOARD. SEE ELECTRICAL DRAWINGS

(n) SEE 5/M6.1 FOR DRAIN DETAIL

Date Signed
PUMP SCHEDULE

NOTES:
1. PROVIDE WITH INVERTER-DUTY MOTOR.
2. PROVIDE WITH VFD WITH INTEGRAL DISCONNECT SWITCH.
3. PUMP IMPELLER & VOLUTE TO REMAIN, MOTOR TO BE REPLACED LIKE FOR LIKE.
4. CONTRACTOR TO MEASURE GPM OF PUMP PRECONSTRUCTION (TYPICAL CWP-1, HWP-1, HWP-2 AND CHWP-1)

CHILLER SCHEDULE

OPERATING WEIGHT (LBS)

ACCESSORIES
- VARIABLE FREQUENCY DRIVE
- REFRIGERANT ISOLATION VALVES
- HOT GAS BYPASS TO 0% LOAD
- BMS INTERFACE BACNET
- IEEE HARMONIC FILTER
- 0.75" CLOSED CELL CHILLER INSULATION
- FACTORY WITNESSED PERFORMANCE TESTING

NOTES:
1. 1" THICK NEOPRENE PADS INCLUDED.
**CHILLED WATER PIPING DIAGRAM**

**Scale:** NTS

**Sheet Notes:**
1. Replace with same size pipe.
2. 6" threaded shut-off valve.
3. Contractor furnished temporary pump for chilled water flush, pipe cleaning, and flushing.

**HEATING HOT WATER PIPING DIAGRAM**

**Scale:** NTS
(ADDENDUM 1)

MECHANICAL DETAILS

M6.1
AD1 M1

TYPICAL PIPING TRENCH AND FLOOR SINK DETAIL

nts
AIR-HANDLING UNIT CONTROL DIAGRAM

SCALE: NTS

DDC CONTROLLER

115VAC FROM AHU

120/24VAC

COMM. + Ø
COMM. - Ø
START/STOP Ø
SPEED Ø
ALARM Ø

VFD W/ BACNET INTERFACE PROVIDED & INSTALLED BY OTHERS (TYPICAL)

TO BAS BACNET HS/TP NETWORK

DUCT STATIC DIFFERENTIAL PRESSURE TRANSDUCER.

BUILDING PRESSURE

BAS INFINET/TP COMM. TO NEXT DEVICE

BAS INFINET/TP COMM. FROM PREVIOUS DEVICE

PROJECT NO.

DATE

REFERENCE SHEET NO.

DSA APP. NO.

DSA FILE NO.

01-115191

321 GOLF CLUB ROAD
PLEASANT HILL
CA

03/01/2016

(ADDENDUM 1)

AIR-HANDLING UNIT CONTROL DIAGRAM

2

AD1 M12

ALPATECH
HEATING HOT-WATER SYSTEM CONTROL DIAGRAM
AHU VAV SYSTEM

9. The following commands/displays shall be available at the OWS for the AHU system ((N) EMS displays shall match (E)):
   a. System graphics showing dynamic status of all points.
   b. Start/Stop.
   c. BACnet VFD interface — supply fan.
   d. Outside air (OSA) temperature from CHWS Controller.
   e. Supply air temperature.
   f. Mixed air temperature.
   g. Supply air temperature setpoint (adjustable)
   h. Duct static pressure setpoint (adjustable)
   i. Building pressure set point
   j. Runtime total for fan operation up to 64,000 hours
   k. Alarms (temperature, air flow)
   l. Chiller Water valve position via actuator position feedback.
   m. Economizer Damper position feedback.
9. The chilled water system pumps will start when the outside air temperature is above 65 deg. F (adjustable) and the AHU chilled water valve is calling for cooling. The status of the pump will be provided through monitoring of VFD status at the pump.
Chilled Water System

9. The chilled water system pump will start when the outside air temperature is above 65 deg. F (adjustable) and the AHU chilled water valve is calling for cooling. The status of the pump will be provided through monitoring of VFD alarm at the pump.
GENERAL NOTES:

1. CONTRACTOR SHALL FIELD VERIFY AND RECORD ALL EXISTING CONDITIONS PRIOR TO THE START OF DEMOLITION.

2. SEE G0.3 FOR PROJECT SEQUENCING REQUIREMENTS.

3. PRIOR TO DEMOLITION, DISTRICT WILL IDENTIFY PARTS AND EQUIPMENT THAT ARE TO BE SALVAGED AND TURNED OVER TO THE DISTRICT.
ADD ALTERNATE 1: PROVIDE 20A/2P POWER CONNECTION FOR B/2 WITH 30A/20AF/2P DISCONNECT. CONNECT BOILERS TO THE EXISTING PANEL "LB" OR "LA" OR "LA" whichever panel has spaces for a 20A/2P BREAKER.