

## **BID OPENING**

**DATE: August 9, 2013**

**TIME: 10:00 A.M.**

**LOCATION: Luecht Conference Center  
Building B, Room 171**

**ADDENDUM No. 01**

**McHenry County College  
Building "D" Remodeling, Building "E" Addition  
Bid package  
ISSUE FOR BID**

**Construction Manager:**  
Pepper Construction Company  
411 Lake Zurich Road  
Barrington, IL 60010  
Author: Brian Lucas

Date: August 1, 2013

The following changes and clarifications have been made in the Contract Documents: Drawings and Specifications Issued for Bid dated July 22, 2013 and insofar as the Contract Documents are inconsistent therewith, the changes mentioned hereafter shall govern. No extension of the bid due date is implied by these changes and clarifications.

**A. Modifications to Specifications:**

**CM Manual:**

1. See attached revised bid form with changes made to Administration of Contracts and adding alternates A2.
2. Bid Period Scope Sheet Changes are as follows:
  - None

**Project Manual:**

Reference Specification 23 09 23 - Direct Digital Controls For HVAC.

1. Replace section in its entirety with attached Section 23 09 23 - Direct Digital Controls for HVAC.

Reference Specification 27 15 00 - Low Voltage Communication Wiring

2. Delete specification section in its entirety.

**B. Modifications to Drawings:**

**ITEM DESCRIPTION**

Reference: Sheet A101 First Floor and Reflected Ceiling Plans - Manufacturing Lab

1. First Floor Plan C1, insert borrowed lite designation: "BL-1" at north wall of Classroom D167a.

Reference: Sheet A102 First and Second Floor Plans - Building E Addition

2. First Floor Plan C1, delete lines in southwest corner of Theater 122 existing concrete slab to be removed and walls to be removed at Passage E108a
3. First Floor Plan C1, Men's Dressing Room E125, delete base designation "B2" and insert "B1".

4. First Floor Plan C1, Vestibule E131, add note: "Dotted outline represents area of recessed floor mat".
5. Second Floor Plan C5, insert borrowed lite designation "BL-2" at west wall of Control Booth E220.
6. Second Floor Plan C5, delete lines for walls to be removed at Passage E219.
7. Second Floor Plan C5, Passage E219, delete floor designation "F1" and insert "F3". Delete "F1" designation at door E220-1 and insert "F3".
8. Second Floor Plan C5, Stair ST-1, Door ST-1-2, delete door type designation "36/A2" and insert "36/A4".

Reference: Sheet A103 Reflected Ceiling Plans - Building E Addition

9. First and Second Floor Plan C1 and C5, Add Note: "See electrical lighting plan for final lighting layout". Disregard note on electrical plans to see architectural plans for lighting layout.

Reference: Sheet A104 Roof Plan - Building E Addition

10. Roof Plan C1, insert note: "Scupper openings on south wall shall be 12'-0" from roof drain".

Reference: Sheet A601 Door Schedule and Details - Building E Addition and Manufacturing Lab

11. Door Elevations, delete door designation: "34" and insert: "24".
12. Aluminum Frames, delete frame designation: "D" and insert: "G".
13. Window at Theater, insert Borrowed Lite designation: "BL-2".

Reference: Sheet S101- Foundation Plan & Details

14. 1/S101: Spread footing noted as "F6" located at grids 3/G.1, 4/G.1 and 5/G.1 to be revised to be the following: "F6: 7'-0" x 7'-0" x 1'-4"; (8) - #5 EA. WAY (TOP & BOTTOM); B/FTG +96'-0"."
15. 1/S101: Add the following note at the east and west ends of the south foundation wall of Stair ST-1; "NOTE A: PROVIDE (2) - #6 DOWELS WITH 8" HOOKED ENDS INTO FOOTING. LAP DOWEL 36" WITH MASONRY ABOVE".
16. 1/S101: At the 5" concrete slab on grade identification; replace the note "T/SLAB +100'-0" (CIVIL \*\*\*\*\*)" with "T/SLAB +100'-0" (CIVIL 919.93)".
17. Refer to attached Partial Foundation Plan Sketch SKS-01 for revisions at the northeast area of the addition.
18. Refer to Sketches SKS-02, SKS-03 and SKS-04 for foundation sections at northeast area of the addition.

Reference: Sheet S102- Second Floor & Low Roof Framing Plan & Details

19. 1/S102: Add the following note at the east and west ends of the south masonry wall of Stair ST-1; "NOTE B: PROVIDE (2) - #6 BARS FULL HEIGHT LAPPED WITH FOUNDATION DOWELS."
20. 6/S102: Add vertical reinforcing bar centered in CMU with the following note: "#4 @ 48" o.c. FULL HEIGHT".
21. Canopy Framing Plan (1A/S102) has been added to Sheet S102. Refer to attached Sketch SKS-

05.

22. Section 15/S102 has been added to Sheet S102. Refer to attached Sketch SKS-06.
23. Provide moment connections of the steel beams to columns per the attached Details SKS-07 and SKS-08. These Details apply at each end of the following beams:
- a. W18x35 (located on Grid G.1, spanning between grids 3 & 4).
  - b. W21x44 (located on Grid G.1, spanning between grids 4 & 5).
  - c. W16x67 (located on Grid 3, spanning between grids D.1 & G.1).
  - d. W24x55 (located on Grid 5, spanning between grids D.1 & G.1).

Reference: Sheet S103- Roof Framing Plan & Details

24. Add the following box note to Sheet S103: "NOTE 4: PROVIDE ANGLE FRAME AT RTU-5 (EXISTING BUILDING 'D' ROOF FRAMING). PROVIDE L5x3 1/2 x 5/16 (LLV) AROUND OPENINGS THROUGH ROOF DECK AND BELOW CURB OF RTU. FIELD WELD ANGLE TO EXISTING BEAM WITH 3/8" TAB WITH 1/4" FILLET WELDS. REFER TO MECHANICAL DRAWINGS FOR LOCATION OF RTU."
25. Provide moment connections of the steel beams to columns per the attached Details SKS-07 and SKS-08. These Details apply at each end of the following beams:
- a. W18x35 (located on Grid G.1, spanning between grids 3 & 4).
  - b. W18x35 (located on Grid G.1, spanning between grids 4 & 5).
  - c. W21x44 (located on Grid 3, spanning between grids D.1 & G.1).
  - d. W21x44 (located on Grid 5, spanning between grids D.1 & G.1)..

Reference: Sheet HV101 - Building "D" Area HVAC Plans

26. Delete IT Closet D167b and all associated HVAC work from south west corner of Manufacturing Lab D167.
27. Revise drawing per sketch SKHV-01.

Reference: Sheet FP101 - First and Second Floor Demolition and New Work Fire Protection Plans

28. Revise drawing per Sketches SKFP-01 and SKFP-02.

Reference: Sheet E101 - Partial First & Second Floor Electrical Demolition Plans

29. Revise drawing note #5 to read: "EXISTING WALL MOUNTED IDF CABINET TO BE RELOCATED. ALL WORK ASSOCIATED WITH RELOCATION SHALL BE CARRIED OUT BY OTHERS."

Reference: Sheet E201 - Partial First Floor Power Plan

30. Building D, revise drawing per sketches SKE-01, SKE-02, SKE-03.

Reference: Sheet E201 - Partial First Floor Electrical Plans

31. Revise drawing per sketches SKE-11, SKE-12.

Reference: Sheet E202 - Partial First Floor Power Plan - Building E Addition

32. Revise drawing note #10 to read: "PROVIDE ROUGH-IN FOR WALL MOUNTED RECESSED SPEAKER. SPEAKER TO BE PROVIDED BY OTHERS."

33. Delete ceiling mounted intercom speaker in Passage E129 and associated drawing note tag.

Reference: Sheet E203 - Partial First Floor Power Plan - Building E Addition

34. Revise drawing note #18 to read: "PROVIDE ROUGH-IN FOR WALL MOUNTED RECESSED SPEAKER. SPEAKER TO BE PROVIDED BY OTHERS."
35. Delete ceiling mounted intercom speaker in Passage E219 and associated drawing note tag.
36. Add (1) area of rescue call station in Stair ST-1 with drawing note 19 to read "AREA OF RESCUE ASSISTANCE CALL STATION. REFER TO ELECTRICAL DETAIL SHEET FOR ADDITIONAL INFORMATION."
37. Revise spacing for ceiling twist-lock receptacles per sketch SKE-04.

Reference: Sheet E301 - Partial First Floor Lighting Plan - Building D

38. Revise drawing per sketch SKE-05.

Reference: Sheet E302 - Partial First Floor Lighting Plan - Building E Addition

39. Revise drawing per sketch SKE-06.

Reference: Sheet E302 - Electrical Schedules and Symbol List

40. Revise drawing per Sketches SKE-13, SKE-14.
41. Delete "PATCH CORD LABELING DETAIL".

Reference: Sheet E303 - Partial Second Floor Lighting Plan - Building E Addition

42. Add (1) area of rescue signage in Passage E219 outside Stair ST-1. Wire to existing exit sign circuit.

Reference: Sheet E401 - Electrical Schedules

43. Revise circuit #26 in "RP-BB" to be 20A-1P C/B to serve "L: WOMEN'S DRESSING ROOM".
44. Revise circuit #28 in "RP-BB" to be 20A-1P C/B to serve "L: MEN'S DRESSING ROOM".

Reference: Sheet E500 - Electrical Symbol List and Schedules

45. Luminaire type "F9" shall be revised to be "INCANDESCENT LIGHT STRIP FOR DRESSING ROOM" as manufactured by Celestial Lighting #AQR-MB-12-SC-D with 60W medium base lamps, 120V, 60 input wattage, Cooper, Lightolier alternate manufacturers and notes 5,6.
46. Luminaire type "F10" shall be revised to be Lithonia Lighting #DOM6 LED 900L 35K 277 DL6T73 with LED lamp type, 25 input wattage and Cooper, Lightolier alternate manufacturers.
47. Revise Interior Lighting Luminaire Schedule note #6 to read: "FINISH TO BE SELECTED BY ARCHITECT. PROVIDE CONTINUOUS RUN OF FIXTURE TO SPAN

THE ENTIRE LENGTH OF MIRRORED WALL."

Reference: Sheet E501 - Electrical Details

- 48. Delete: "SPEAKER OUTLET DETAIL".
- 49. Delete: "COAX OUTLET DETAIL".
- 50. Delete: "DATA OUTLET DETAIL".
- 51. Revise note in "3-PIN XLR OUTLET DETAIL" to read: "HOMERUN ONE (1) PLENUM-RATED, SHIELDED 22AWG CABLE AS MANUFACTURED BY WEST PENN #D25291 PULLED TO JUNCTION BOX IN CONTROL BOOTH. PROVIDE MALE TERMINATION AT OTHER END WITH 10 FEET OF ADDITIONAL SLACK COILED AT CONTROL BOOTH. APPROVED MANUFACTURERS: BELDEN."
- 52. Revise note in "5-PIN XLR OUTLET DETAIL" to read "HOMERUN ONE (1) PLENUM-RATED, SHIELDED 24AWG CABLE AS MANUFACTURED BY WEST PENN #D252402 PULLED TO JUNCTION BOX IN CONTROL BOOTH UNLESS NOTED OTHERWISE. PROVIDE MALE TERMINATION AT OTHER END WITH 10 FEET OF ADDITIONAL SLACK COILED AT CONTROL BOOTH. APPROVED MANUFACTURERS: BELDEN."
- 53. Revise "JUNCTION BOX ROUGH-IN DETAIL" per sketch SKE-07.

Reference: Sheet E502 - Electrical Details

- 54. Delete: "IDF RACK DETAIL".
- 55. Delete: "PATCH CORD LABELING DETAIL".
- 56. Revise note in "TELECOMMUNICATIONS EQUIPMENT DETAIL" to wire ground wire to existing structural member in lieu of ground rod.
- 57. Revise "PROJECTOR SYSTEM DIAGRAM" per sketch SKE-08.
- 58. Add "THEATER E122 CEILING DEVICE SUPPORT DETAIL" per sketch SKE-09.
- 59. Add "AREA OF RESCUE ASSISTANCE WIRING SCHEMATIC" per sketch SKE-10.

#### **Attachments:**

Section 23 09 23

Sketches:

SKS-01, SKS-02, SKS-03, SKS-04, SKS-05, SKS-06, SKS-07, SKS-08, SKHV-01, SKFP-01, SKFP-02, SKE-01, SKE-02, SKE-03, SKE-04, SKE-05, SKE-06, SKE-07, SKE-08, SKE-09, SKE-10, SKE-11, SKE-12, SKE-13, SKE-14

#### **C. CONTRACTOR QUESTIONS / MISC.:**

None at this time.

**D. Pre-Bid Meeting Minutes:**

See attached.

End of Addendum No. 1





**PEPPER**  
CONSTRUCTION

**McHenry County College  
Building E Addition & Building D Remodeling**

**BID FORM – Addendum #01  
8/01/13**

Submitted By:

\_\_\_\_\_  
(Subcontractor)

Date: \_\_\_\_\_, 2013

\_\_\_\_\_  
(Address)

**BIDS DUE: August 9<sup>th</sup>, 2013 @ 10:00AM**

McHenry County College  
8900 US Hwy 14  
Crystal Lake, IL 60012

Attn: Jennifer Jones, Director of Business Services

We, the undersigned Bidder having familiarized ourselves with the site, the local conditions affecting the cost of the Project and the Bidding and Contract Documents, including Addenda and all Invitation to Bid Addendum and Project Memos for the construction of the project **McHenry County College Building E Addition & Building D Remodeling** as specified, do hereby propose to provide and furnish all labor, materials, tools, equipment, utility and transportation services, scaffolding, insurance, supervision and all other services and facilities necessary, as required by said Contract Documents to complete all work as hereinafter designated, for the sum of money enumerated, the said amount, constituting the base bid, July 22, 2013 as prepared by Pepper Construction Company.

The Contract Documents that constitute the basis of our proposal for the work include the Construction Manager Manual, dated July 22, 2013, as prepared by Pepper Construction Company.

If awarded the Contract, the undersigned agrees to complete all work under the Base Bid and Alternates, in accordance with the Schedule specified in the Construction Management Manual.

**BASE BID**

All prices quoted represent the entire cost of the project in accordance with the bidding documents, not including the performance and payment bonds, (see Alternate A1) and we acknowledge that no subsequent claim will be recognized for any increase in wage scales, material prices, cost or any other rates affecting the construction industry and/or this project.

**Bid Package #:** \_\_\_\_\_

**Base Bid**

Total Base Bid \$ \_\_\_\_\_

Written : \_\_\_\_\_



### **Addenda Acknowledgement**

Bidder acknowledges that having received the following addenda for the project :

Addendum # :

Date :

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

### **Alternates/Break-Out Pricing**

The undersigned hereby proposes to furnish everything required for completion of the Alternates indicated. The following amounts for Alternate construction may be added to or deducted from the Base Bid, if selected. Bidders are required to respond to **all** alternates, and shall indicate \$0 if there is no cost impact to their base bid. Alternate pricing shall be held until November 2013. Clearly designate if the Alternate is an Add or Deduct by circling the appropriate term.

### **Alternates**

Alternate A1 : Provide Performance and Payment Bond Add/ Deduct \$ \_\_\_\_\_

Alternate A2 : Provide Alternate Black Box Theatre Connect Strip layout. Add/ Deduct \$ \_\_\_\_\_

### **Subcontractor Suggested Voluntary Alternates**

1. _____	Add/Deduct	\$ _____
2. _____	Add/Deduct	\$ _____
3. _____	Add/Deduct	\$ _____
4. _____	Add/Deduct	\$ _____

### **EXPERIENCE MODIFICATION RATING (EMR)**

Provide your firm's Experience Modification Rating (EMR) for the last three (3) years. Please consult your insurance agent for this information.

2012 \_\_\_\_\_

2011 \_\_\_\_\_

2010 \_\_\_\_\_

**ITEMS TO BE RETURNED WITH BID FORM**

- ☐ Labor Rate Worksheets (All Trades)
- ☐ Please indicate that you have already submitted your Pre-Qualification Form to Pepper Construction for review.
- ☐ Non-Collusion Affidavit
- ☐ Bidder's Eligibility Certification
- ☐ Certificate of Compliance: Illinois Human Rights Act
- ☐ Certificate of Compliance: Illinois Drug-Free Workplace Act
- ☐ Supplementary Qualification Statement (See Spec Section 004513)

**Contact for Scope Review Meeting**

\_\_\_\_\_  
**Name**

\_\_\_\_\_  
**Company**

\_\_\_\_\_  
**Cell Phone #**

\_\_\_\_\_  
**Email Address**

**ADMINISTRATION OF CONTRACTS**

The undersigned, in submitting this document, agrees that if he is the successful Bidder, he will accept administration of the Contract by Pepper Construction Company and enter into a Contract according to the terms and conditions of the Pepper Construction Prime Trade Agreement, a sample of which is included in the contract documents, un-altered.

The undersigned agrees, within 10 days after notice of acceptance of this bid, to provide required Insurance and enter into Contract, for the Work.

In submitting this proposal, it is hereby understood that the Owner reserves the unrestricted privilege of rejecting any or all Bids, or parts of Bids, and to waive any informalities which may be considered an immaterial variance as determined by Owner in Bidding.

It is agreed that this proposal shall be irrevocable for a period of ninety (90) days after the specified date for receiving Bids.

**McHenry County College**  
**Building E Addition & Building D Remodeling**  
**BID FORM**  
**Page 4 of 4**

\_\_\_\_\_  
(Firm Name)

\_\_\_\_\_  
(By)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Witness)

\_\_\_\_\_  
(Date)

OFFICIAL ADDRESS

\_\_\_\_\_  
(Street)

\_\_\_\_\_  
(City, State and Zip Code)

\_\_\_\_\_  
(Telephone No.)

**DIRECT DIGITAL CONTROLS FOR HVAC**  
**SECTION 23 09 23**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.02 SUMMARY**

- A. Section Includes
  - 1. Control equipment.
  - 2. Software.
- B. Related Sections
  - 1. Section 230900 - Instrumentation and Control for HVAC
  - 2. Section 230993 - Sequence of Operation for HVAC Controls.

**1.03 REFERENCES**

- A. ASME MC85.1 - Terminology for Automatic Control.
- B. NEMA EMC1 - Energy Management Systems Definitions.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. NFPA 70 - National Electrical Code.
- E. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

**1.04 SYSTEM DESCRIPTION**

- A. Provide extension of existing Web-Based Trane Controls temperature control system at McHenry County College Campus consisting of hardware and software as required to fully support all new systems. Existing Web Browser Client, Universal Network Controller, Software, etc. shall be utilized and expanded to fully integrate all new systems and sequences.
- B. Building Automation System shall be web based so any computer with a browser and access to the internet can access the Building Automation System, view graphics, receive alarms, etc. for all schools. All control points listed in Section 230993 - "Sequence of Operation" shall be performed by the DDC system and displayed on the existing Operator Workstation. Any other control work required to complete the sequence of operation specified in Section 230993 may be electric or electronic. Contractor shall provide all transformers, relays etc. necessary for a complete operating system.

- C. Furnish all labor, materials, equipment, and service necessary for a complete and operating temperature control system, utilizing a high speed peer to peer network of interoperable Direct Digital Controls (DDC), local Graphical User Interface (GUI). The Local Area Network (LAN) shall be either a 10 or 100 Mbps Ethernet network supporting BACnet, Java, XML, HTTP, and CORBA IIOP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Universal Network Controllers (UNCs), user workstations and a local host computer system.
- D. The Enterprise Ethernet (IEEE 802.3) LAN shall utilize Carrier Sense Multiple/Access/Collision Detect (CSMA/CD), Address Resolution Protocol (ARP) and User Datagram Protocol (UDP) operating at 10 or 100 Mbps.
- E. The system will consist of an open architecture that utilizes EIA standard 709.1, the LonTalk™ protocol, as the common communication protocol between all controllers and integral ANSI / ASHRAE™ Standard 135-2004, BACnet functionality to assure interoperability between all system components. Both the LonTalk™ protocol and the ANSI / ASHRAE™ Standard 135-2004, BACnet protocol are required to assure that the project is fully supported by the leading HVAC open protocol to reduce future building maintenance, upgrade, and expansion costs.
- F. The system will consist of an architecture that utilizes a RS/485 selectable 9.6-76.8 K9600 Baud protocol, as the common communication protocol between all controllers and integral ANSI / ASHRAE™ Standard 135-2004, BACnet functionality to assure interoperability between all system components. Large capacity DDC controllers (AACs) shall be capable of communicating as a RS/485 device or as a BACnet IP device communicating at 10/100 Mbps on a TCP/IP trunk. The AAC shall have a RS/485 bus that is capable of supporting up to 127 UECs or VAVDDCs without the addition of repeaters. The ANSI / ASHRAE™ Standard 135-2004, BACnet protocol is required to assure that the project is fully supported by the leading HVAC open protocol to reduce future building maintenance, upgrade, and expansion costs.
- G. The software tools required to network manage both the LonTalk™ protocol and the ANSI / ASHRAE™ Standard 135-2004, BACnet protocol must be provided with the system. Drawings are diagrammatic only. Equipment and labor not specifically referred to herein or on the plans that are required to meet the functional intent, shall be provided without additional cost to the Owner. Minimum BACnet compliance is Level 3; with the ability to support data read and write functionality. Physical connection of BACnet devices shall be via Ethernet/Ethernet IP or RS/485.
- H. Complete temperature control system to be DDC with electronic sensors and electronic/electric actuation of Mechanical Equipment Room (MER) valves and dampers and electronic actuation of terminal equipment valves and actuators as specified herein. The BAS is intended to seamlessly connect devices throughout the building regardless of subsystem type, i.e. variable frequency drives, low voltage lighting systems, electrical circuit breakers, power metering and card access should easily coexist on the same network channel.
  - 1. The supplied system must incorporate the ability to access all data using Java enabled browsers without requiring proprietary operator interface and configuration programs.
  - 2. An Open DataBase Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage.
    - (a) This data shall reside on a supplier-installed server for all database access.
    - (b) Systems requiring proprietary database and user interface programs shall not be acceptable.
    - (c) A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer's internal Intranet network.

(d) Systems employing a "flat" single tiered architecture shall not be acceptable.

- I. All work described in this section shall be installed, wired, circuit tested and calibrated by factory certified technicians qualified for this work.

#### 1.05 SUBMITTALS FOR REVIEW

- A. Section 013300 - Submittals: Procedures for submittals.
- B. Product Data: Provide data for each system component and software module.
- C. Shop Drawings:
1. List connected data points, including connected control unit and input device.
  2. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration diskette containing graphics.
  3. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
  4. Indicate description and sequence of operation of operating, user, and application software.
  5. Ensure terminology used in submittals conforms to ASME MC85.1.

#### 1.06 SUBMITTALS FOR INFORMATION

- A. Section 013300 - Submittals: Procedures for submittals.
- B. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.
1. Each control device labeled with setting or adjustable range of control.
- C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
1. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
  2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
  3. Details of control panel faces, including controls, instruments, and labeling.
  4. Written description of sequence of operation.
  5. Schedule of dampers including size, leakage, and flow characteristics.
  6. Schedule of valves including close-off and flow characteristics.
  7. Trunk cable schematic showing programmable control unit locations and trunk data conductors.



8. Listing of connected data points, including connected control unit and input device.
  9. System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.
  10. System configuration showing peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
- D. External Interface Files: XIF files or object diagrams for each DDC system component (Custom Application Controller and Application Specific Controller) proposed.
- E. PIC/BIBB statement clarifying which BACnet objects and services are supported by each controller.
- F. ANSI / ASHRAE™ Standard 135-2004, BACnet PIC/BIBB Statement: Proof of Compliance Level 3 or higher is required to protect building owner by reducing future maintenance and expansion costs.
- G. Samples: For each color required, of each type of thermostat cover.
- H. Software and Firmware Operational Documentation: Include the following:
1. Engineering, Installation, Operation and Maintenance manuals.
  2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
  3. Device address list.
  4. Printout of software application and graphic screens.
  5. Licenses, guarantee, and warranty documents for all equipment and systems.
- I. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- J. Maintenance Data: For systems to include in maintenance manuals specified in Division 1. Include the following:
1. Maintenance instructions and lists of spare parts for each type of control device and compressed air station.
  2. Interconnection wiring diagrams with identified and numbered system components and devices.
  3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
  4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
  5. Calibration records and list of set points.
- K. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- L. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.

#### **1.07 SUBMITTALS AT PROJECT CLOSEOUT**

- A. Section 017700 - Closeout Procedures: Procedures for submittals.
- B. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
  - 1. Revise shop drawings to reflect actual installation and operating sequences.
  - 2. Include data specified in "Submittals" in final "Record Documents" form.
- C. Operation and Maintenance Data:
  - 1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
  - 2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
  - 3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
- D. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owners name and registered with manufacturer.

#### **1.08 REGULATORY REQUIREMENTS**

- A. International Building Code, 2003 Edition
- B. International Mechanical Code, 2003 Edition
- C. National Electrical Code, Nfpa 70, 2002 Edition
- D. McHenry County Health Department
- E. Illinois Accessibility Code (71 Administrative Code 400) Current Edition
- F. 2009 International Energy Conservation Code
- G. 2009 International Fire Code (Excluding Chapter 4)
- H. 2009 International Property Maintenance Code
- I. Fire Prevention and Safety (41 Administrative Code 100), Current Edition
- J. NFPA 101 Life Safety Code, Current Edition

#### **1.09 MAINTENANCE SERVICE**

- A. Section 017700 - Closeout Procedures.

- B. All components, system software, and parts furnished and installed by the BAS contractor shall be guaranteed against defects in materials and workmanship for 1 year of substantial completion. Labor to repair, reprogram, or replace these components shall be furnished by the BAS contractor at no charge during normal working hours during the warranty period. Materials furnished but not installed by the BAS contractor shall be covered to the extent of the product only. Installation labor shall be the responsibility of the trade contractor performing the installation. All corrective software modifications made during warranty periods shall be updated on all user documentation and on user and manufacturer archived software disks. The Contractor shall respond to the owner's request for warranty service within 24 standard working hours.

## **PART 2 - PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS/INSTALLERS**

- A. Trane  
Trane Chicago  
7100 Madison  
Willowbrook, IL 60521  
630-734-3200
- B. No substitutions.

### **2.02 WEB BROWSER CLIENTS**

- A. The system shall be capable of supporting 64 clients using a standard Web browser such as Internet Explorer™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, are only acceptable if 64 licensed copies of the client machine software are provided, installed, and tested.
- B. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the BAS, shall only be acceptable if 64 workstations or workstation hardware upgrades are provided.
- C. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.
- D. The Web browser client shall support at a minimum, the following functions:
1. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
  2. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
  3. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
  4. Storage of the graphical screens shall be in the Building Control Units (BC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.

5. Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.
6. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
  - (a) Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
    - (i) Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
    - (ii) Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
  - (b) Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
  - (c) View logs and charts
  - (d) View and acknowledge alarms
7. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.
8. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

## 2.03 CONTROL UNITS GENERAL

- A. Provide an adequate number of control units to achieve monitoring and control of all data points specified and necessary to satisfy the sequence of operation for all mechanical systems shown on the plans. Provide a minimum of one separate controller for each AHU or other HVAC system. Multiple DDC controllers may control one system provided that all points associated with individual control loops are assigned to the same DDC controller. Points used for control loop reset such as outside air or space temperature are exempt from this requirement.
- B. All device bus controllers shall be stand alone. In the event of a loss of field bus communications, all field bus controllers shall maintain core control functionality. It is understood that global control functions would be suspended until communications are restored. Applications using field bus peer-to-peer communications will need to be engineered such that basic control can be maintained during a loss of field bus communication. Devices requiring a network level device to perform core/basic control functions are not acceptable.
- C. All device bus controllers shall be fully programmable, including application specific devices for VAV boxes, fan coil units, unit ventilators, and roof top units. Any spare I/O shall be available for owner designated applications and be subject to the functional requirements of the preceding paragraph. Configurable devices or satellite I/O controlled by another device are not acceptable.
- D. All field controllers, including central equipment and terminal unit controllers shall have fully programmable logic and sequences of operation, utilizing a Microsoft Visio based graphical programming interface tool.

- E. All field controllers, including the BACnet and LonWorks based controllers, must be programmable from a single Microsoft Visio based programming tool.
- F. The network images/network variable for both BACnet and LonWorks based controllers must be fully programmable from a single Microsoft Visio based programming tool.
- G. Each of the following panel types shall meet the following requirements.
  - 1. Controllers shall be suitable for the anticipated ambient conditions.
  - 2. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures, and shall be rated for operation at -40°F to 140°F and 5 to 95% RH, non condensing.
  - 3. Controllers used in conditioned ambient space shall be mounted in dustproof enclosures, and shall be rated for operation at 32°F to 122°F and 5 to 95% RH, non condensing.
  - 4. Serviceability: Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
  - 5. Memory: The Control Units shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.
  - 6. Diagnostics: The Building Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall assume a predetermined failure mode and generate an alarm notification.
  - 7. Immunity to power and noise: Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 ft.
  - 8. Automatic staggered restart of field equipment after restoration of power and short cycle protection.

#### 2.04 UNIVERSAL NETWORK CONTROLLERS (UNC)

- A. The Universal Network Controllers (UNC) shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the UNC. It shall be capable of executing application control programs to provide:
  - 1. Calendar functions
  - 2. Scheduling
  - 3. Trending
  - 4. Alarm monitoring and routing
  - 5. Time synchronization by means of an Atomic Clock Internet site including automatic synchronization
  - 6. Integration of LonWorks controller data and BACnet controller data
  - 7. Network Management functions for all LonWorks based devices

- B. The Universal Network Controller Type 2 must provide the following hardware features as a minimum:
1. One Ethernet Port - 10/100 Mbps
  2. Two RS-232 ports
  3. Four RS-485 ports electrically isolated
  4. One LonWorks Interface Port - 78KB FTT-10A with Weidmuller connector
  5. Power supply 24 VAC or 24 VDC
  6. Battery Backup
  7. Real-time clock
  8. Processor @ 200 MHz or greater
  9. 64 Mb flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity)
  10. 128 Mb Ram or greater
- C. The UNC shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the UNC shall be an ODBC compliant database or must provide an ODBC data access mechanism to read and write data stored within it.
- D. The UNC shall support standard Web browser access via the Intranet/Internet. It shall support a minimum of 64 simultaneous users.
- E. Event Alarm Notification and Actions
1. The UNC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
  2. The UNC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up telephone connection, or wide-area network.
  3. Alarm generation shall be selectable for annunciation type and acknowledgment requirements including but limited to:
    - (a) To alarm
    - (b) Return to normal
    - (c) To fault
  4. Provide for the creation of a minimum of eight of alarm classes for the purpose of routing types and or classes of alarms, i.e.: security, HVAC, Fire, etc.
  5. Provide timed (schedule) routing of alarms by class, object, group, or node.



6. Provide alarm generation from binary object "runtime" and /or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.
7. Control equipment and network failures shall be treated as alarms and annunciated.
8. Alarms shall be annunciated in any of the following manners as defined by the user:
  - (a) Screen message text
  - (b) Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:
    - (i) Day of week
    - (ii) Time of day
    - (iii) Recipient
  - (c) Pagers via paging services that initiate a page on receipt of email message
  - (d) Graphic with flashing alarm object(s)
  - (e) Printed message, routed directly to a dedicated alarm printer
9. The following shall be recorded by the UNC for each alarm (at a minimum):
  - (a) Time and date
  - (b) Location (building, floor, zone, office number, etc.)
  - (c) Equipment (air handler #, accessway, etc.)
  - (d) Acknowledge time, date, and user who issued acknowledgement.
  - (e) Number of occurrences since last acknowledgement.
10. Alarm actions may be initiated by user defined programmable objects created for that purpose.
11. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.
12. A log of all alarms shall be maintained by the UNC and/or a server (if configured in the system) and shall be available for review by the user.
13. Provide a "query" feature to allow review of specific alarms by user defined parameters.
14. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.
15. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.

F. Data Collection and Storage

1. The UNC shall have the ability to collect data for any property of any object and store this data for future use.
2. The data collection shall be performed by log objects, resident in the UNC that shall have, at a minimum, the following configurable properties:
  - (a) Designating the log as interval or deviation.
  - (b) For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
  - (c) For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
  - (d) For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
  - (e) Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.
3. All log data shall be stored in a relational database in the UNC
4. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.
5. All log data shall be available to the user in the following data formats:
  - (a) HTML
  - (b) XML
  - (c) Plain Text
  - (d) Comma or tab separated values
6. Systems that do not provide log data in HTML and XML formats at a minimum shall provide as an alternative Microsoft SQL Server®, Oracle 8i or Express®, Hyperion Solutions™ SQL Server.
7. The UNC shall have the ability to archive its log data either locally (to itself), or remotely to a server or other UNC on the network. Provide the ability to configure the following archiving properties, at a minimum:
  - (a) Archive on time of day
  - (b) Archive on user-defined number of data stores in the log (buffer size)
  - (c) Archive when log has reached its user-defined capacity of data stores
  - (d) Provide ability to clear logs once archived

G. Audit Log

1. Provide and maintain an Audit Log that tracks all activities performed on the UNC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the UNC), to another UNC on the network, or to a server. For each log entry, provide the following data:
  - (a) Time and date
  - (b) User ID
  - (c) Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.
2. Database Backup and Storage
  - (a) The UNC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.
  - (b) Copies of the current database and, at the most recently saved database shall be stored in the UNC. The age of the most recently saved database is dependent on the user-defined database save interval.
  - (c) The UNC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

#### 2.05 ADVANCED APPLICATION CONTROLLER (AAC)

- A. For the existing facility provide and install New AHU DDC controllers and large point count controllers. New controllers shall support open system hardware and software including BACnet protocols and standards.
- B. AACs consist of processor board with programmable, nonvolatile, RAM/EEPROM memory for custom control applications. AACs shall be provided for large AHUs, Boiler Plant, Chiller Plant and other applications as shown on drawings.
- C. Units monitor or control each input/output point; process information; and at least 50 expressions for customized HVAC control including mathematical equations, Boolean logic, PID control loops with anti-windup, sequencers, timers, interlocks, thermostats, enthalpy calculation, counters, interlocks, ramps, drivers, schedules, calendars, OSS, compare, limit, curve fit, and alarms.
- D. The Advanced Application Controller shall have the following point count as a minimum.
  1. 4 Digital Inputs.
    - (a) 10 pulses per second.
  2. 12 Universal Inputs
    - (a) 0-20mA
    - (b) 0-5 VDC
    - (c) Balco Sensors
    - (d) Platinum Sensor
    - (e) 10K thermistor

3. 8 Universal Outputs
  - (a) 0-20 mA
  - (b) 12 VDC relay driver
  - (c) Individually short circuit protected
  - (d) LED indication
4. 8 Digital Outputs
  - (a) Triacs
  - (b) LED indication
5. The controller shall come with an on board regulated 20 VDC power supply rated at 100 mA.
6. The controller shall have removable terminals for:
  - (a) 24 VAC Power inputs
  - (b) MS/TP Communication terminals
7. Stand-alone mode control functions operate regardless of network status. Functions include the following:
  - (a) Peer to peer primary network level communications supporting BACnet objects and services according to PIC and BIBBs statement.
  - (b) Automatic communications loss detection to maintain normal control functionality regardless of available networks communications.
  - (c) Discrete/digital, analog, and pulse input/outputs.
  - (d) Monitoring, controlling, or addressing data points.
  - (e) Local energy management control strategies
  - (f) Incorporate internal customizable safeties and limits to prevent third party BACnet tools from providing improper and unrealistic inputs to AACs.
8. Local operator interface port provides for download from and connection to portable workstation.
9. Communication:
  - (a) The Advanced Application Controller shall communicate via the Primary Controller Network between BAS Controllers and other BACnet devices.
  - (b) Communication shall be peer-peer.
  - (c) AACs shall communicate with and other BACnet devices at a baud rate selectable between 9.6 and 76.8 Baud using MS/TP communications protocol.
  - (d) AAC shall communicate with the UNC using:

- (i) RS-485 trunk with a baud rate selectable between 9.6 and 76.8 Kbaud using MSTP communications protocol.
- (ii) An Ethernet trunk 10/100 Mb using BACnet IP.

**2.06 UNITARY EQUIPMENT CONTROLLER UNITS:**

- A. Single board construction comprising processor board with programmable, nonvolatile, RAM/EEPROM memory for custom control and unitary applications. UECs shall be provided for Unit Ventilators, Fan Coils, Heat Pumps, Rooftop Units, and other applications as shown on the drawings. To assure complete interoperability, all UECs firmware shall support all BACnet objects and services as called out in the PIC and BIBBs statement.
- B. The Unitary Equipment Controller shall have the following point count as a minimum.
  - 1. 6 Universal Inputs
    - (a) 0-20mA
    - (b) 0-5 VDC
    - (c) Balco Sensors
    - (d) Platinum Sensor
    - (e) 10K thermistor
  - 2. 4 Analog Outputs
    - (a) 0-20 mA
    - (b) 0-5/10 VDC
    - (c) Individually short circuit protected
  - 3. 8 Digital Outputs
    - (a) Triacs
    - (b) LED indication
- C. Units monitor or control each input/output point; process information; and download from the operator station.
- D. The controller shall have removable terminals for:
  - 1. 24 VAC Power inputs
  - 2. MS/TP Communication terminals
- E. Stand-alone mode control functions operate regardless of network status. Functions include the following:
  - 1. Peer to peer primary network level communications with automatic communications loss detection to maintain normal control functionality regardless of available network communications.

2. Discrete/digital, analog, and pulse input/output.
  3. Monitoring, controlling, or addressing data points.
  4. Appropriate BACnet Objects for specific unitary applications.
- F. Local operator interface port located on UEC and UEC sensor provides for download from or upload to portable workstation. All bus devices shall be accessible from either port.
  - G. Communication: UECs shall communicate with the UNC and ACC at a baud rate selectable of 9.6-76.8 Kbaud utilizing MS/TP.
  - H. UEC units monitor or control each input/output point; process information; and at least 50 expressions for customized HVAC control including mathematical equations, Boolean logic, PID control loops with anti-windup, sequencers, timers, interlocks, thermostats, counters, interlocks, compare, limit, and alarms.
  - I. All UEC Controller setpoints shall be digital display setpoints with dual setpoint limits (integral hard limits which the user cannot exceed above and below and independent soft limits which are hidden from the user). All digital setpoints shall be network retentive after power outages and after replacement of sensor.

**2.07 ASC - FAN COIL UNIT, UNIT VENTILATOR, HEAT PUMP, OR PACKAGED ROOFTOP CONTROLLER FUNCTIONALITY.**

- A. Controls shall be microprocessor based as shown in the drawings or indicated in the sequence of operations. The ASC shall be a single integrated package consisting of a microprocessor, power supply, field terminations, and application software. The units shall be started and stopped from the BAS. A low limit protection thermostat in the mixed air section of the unit shall close down the outdoor air damper, open coil valves, and alarm the BAS when a temperature below 38°F (adjustable) is sensed. All input/output signals shall be directly hardwired to the ASC controller. In all cases, the controller shall automatically resume proper operation following the return of power to, or control by the ASC.
- B. All ASCs must have an operating temperature range -40°F to 140°F and 5 to 95% RH, non condensing because they are located in the proximity of extreme temperatures (hot water/steam pipes or the outdoor air.)
- C. All ASCs shall have capability for both ASHRAE Cycle II and ASHRAE Cycle III fully tested and validated. Bidder shall provide application documentation for ASC ASHRAE cycle II and III compliance including sequence of operation, controller program, and available SNVT's. The control program shall also be fully customizable in the field to accommodate any local or project specific requirements that may be required.
- D. All duct averaging sensors for ASCs must be true continuous averaging units that sense the mean temperature over the complete length of the sensor end to end. Sensors that provide four or nine sensing points, which may be accurate due to air temperature stratifications, are not acceptable.
- E. All ASCs shall be easily replaceable for ease of future maintenance and to minimize downtime.
- F. The outputs of the ASC shall be of the relay Form C and universal analog form. All digital outputs shall be relay type Form C. ASC devices utilizing non-relay outputs shall provide an interface relay for all points. All analog outputs shall be programmable for their start points and span to accommodate the control devices.

**2.08 LANs:**



- A. Capacity for a minimum of 64 client workstations connected to multi-user, multitasking environment with concurrent capability to access DDC network or control units.
- B. Enterprise Network LAN
  - 1. Media: Ethernet (IEEE 802.3), peer-to-peer CSMA/CD, operating at 10 or 100 Mbps, cable 10 Base-T, UTP-8 wire, category 5
- C. Primary Controller Network LAN (LonWorks Applications)
  - 1. Media: LonTalk™ (EIA 709.1), peer to peer, FTT-10 operating at 78.8K.
- D. Secondary Network LAN ( If Required)
  - 1. Media: LonTalk™ (EIA 709.1), peer to peer, FTT-10 operating at 78.8K
- E. Primary Controller Network LAN (BACnet Applications)
  - 1. ANSI / ASHRAE™ Standard 135-2004, BACnet protocol
- F. Remote Connection
  - 1. ISDN, ADSL, T1 or dial-up connection, monthly charges paid by building owner

## 2.09 SOFTWARE:

- A. Controller and System HVAC Applications
  - 1. Update to latest version of software at Project completion. Include and implement the following capabilities from the control units if documented by the specified sequence of operations:
    - (a) Load Control Programs: Demand limiting, duty cycling, automatic time scheduling, start/stop time optimization, occupied/unoccupied setback/setup, DDC with PID, and trend logging.
    - (b) HVAC Control Programs: Optimal run time, supply-air reset, and enthalpy/economizer switchover.
    - (c) Chiller Control Programs: Chilled water plant optimization with condenser water reset, chilled-water reset, chiller and pump equipment selection and sequencing.
    - (d) Boiler Control Programs: Boiler plant optimization with hot water supply reset, boiler and pump equipment selection and sequencing.
    - (e) Programming Application Features: Include trend point, alarm reporting, alarm lockout, weekly scheduling, staggered start, sequencing, anti-short cycling and calculated point.
- B. Controller and Network Setup Software
  - 1. Network managements tools for LonTalk™ protocol and the ANSI / ASHRAE™ Standard 135-1995, BACnet protocol shall be provided including a network learn function, LonMark bindings, service pins, winks, and diagnostics.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

### **3.02 INSTALLATION**

- A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.
- B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 230993.
- C. Electrical material and installation shall be in accordance with appropriate requirements of Electrical Code.

### **3.03 MANUFACTURER'S FIELD SERVICES**

- A. Prepare and start systems.
- B. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

### **3.04 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.
  - 1. Leak Test: After installation, fill system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment, and retest.
  - 4. Pressure test control for air piping:
    - (a) Pressure test control air piping at 30 psig. or 1.5 times the operating pressure for 24 hours, with maximum 5 psig. loss.
    - (b) Pressure test high-pressure control air piping at 150 psig. and low-pressure control air piping at 30 psig. for 2 hours, with maximum 1 psig.
  - 5. Calibration and test electric/electronic thermostats by disconnecting input sensors and stimulating operation with compatible signal generator.
- B. Replace damaged or malfunctioning controls and equipment.
  - 1. Start, test, and adjust control systems.

2. Demonstrate compliance with requirements, including calibration and testing, and control sequences.
  3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.
- C. Verify DDC as follows:
1. Verify software including automatic restart, control sequences, scheduling, reset controls, and occupied/unoccupied cycles.
  2. Verify operation of local operator workstation.
  3. Verify local control units including self-diagnostics.

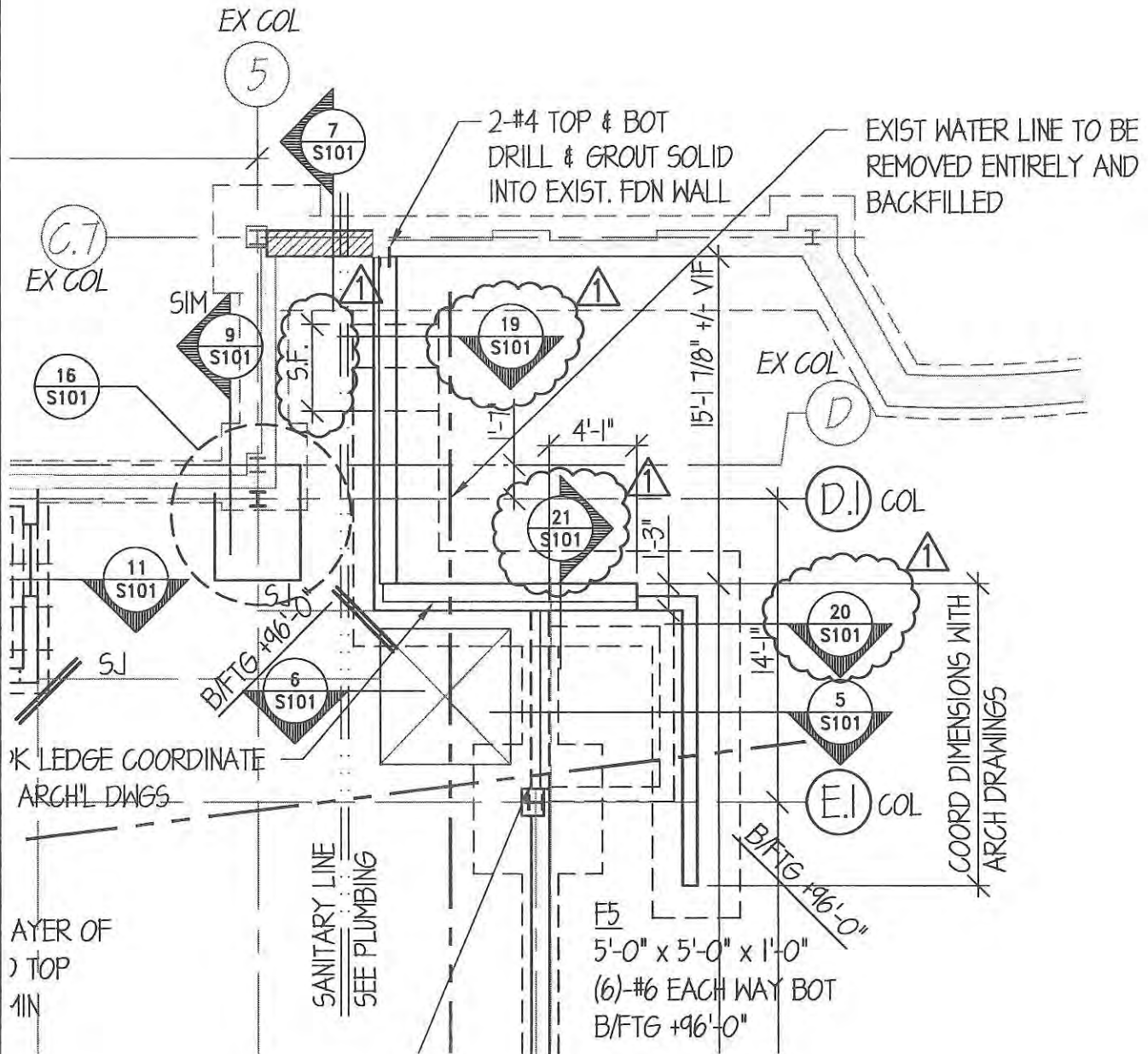
### 3.05 **TRAINING**

- A. Provide service engineer to instruct Owner's representative in operation of systems plant equipment. On site training shall consist of 16 hour period initially in increments of 4 hours and another 40 hours at times of the owner's choosing. This time shall be for training only, not maintenance of system. Contractor shall prepare a time log sheet, obtaining owner's signature after training sessions and provide updates to owner after each session until training time is complete.

### 3.06 **INPUT/OUTPUT SCHEDULES**

- A. See Specification Section 230993 - "Sequence of Operations".

END OF SECTION



1  
S101

# FOUNDATION PLAN-BASE BID

1/8" = 1'-0"



ADDENDUM #

1550-A-1

1327.01

**SKS-01**

26 July 2013

**Ruck Pate**

ARCHITECTURE

22102 North Pepper Road, Suite 201  
Barrington, Illinois 60010

tel 847.381.2948  
fax 847.304.1218  
www.ruckpate.com

Bldg. "D" Rmodeling, Bldg. "E" Addition  
Main Campus  
McHenry County College  
8900 US HWY 14  
Crystal Lake, IL 60012



