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**To:** Prospective Bidders  
**From:** Wold Architects and Engineers  
**Date:** September 1, 2015  
**Comm. No:** 142022

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**Subject:** Addendum No. 2 for Bidding Documents for the: **Eden Prairie Schools  
Administrative Service Center  
Welcome Center Project**

**BIDS DUE SEPTEMBER 15, 2015 AT 3:00 P.M.**

This addendum forms a part of the Contract Documents dated August 18, 2015. Acknowledge receipt of this Addendum on the space provided on the Bid Form. Failure to do so may result in disqualification of Bid.

This Addendum consists of two (2) typed sheets and attachments:  
Specification Sections: 23 09 93, 23 82 33  
Drawings: A1.11, M1

**PROJECT MANUAL**

- 1. SPECIFICATION SECTION 23 09 93 BAS SEQUENCE OF OPERATIONS**
  - A. Reissued this addendum
- 2. SPECIFICATION SECTION 23 82 33 HEATING TERMINAL UNITS**
  - A. Reissued this addendum

**PRIOR APPROVALS**

The following schedule amends designated specification sections to list additional acceptable manufacturers. Use of any product by any of these manufacturers will be permitted only if after review of shop drawings or detailed product data per Section 01 33 00, Architect determines that proposed materials or equipment are equivalent in performance, construction and appearance to product(s) specified.

Where anticipated product substitutions would alter the design or space requirements indicated on the Drawings, pay for cost of design and construction revisions including the cost of associated work by other contractors.

For complete requirements, see Specification Section 01 25 00 – Substitutions and Product Options.

<u>Section No.</u>	<u>Item</u>	<u>Type</u>	<u>Acceptable Manufacturer</u>
23 81 23	2.01A		Data Aire
23 81 23	2.02A		Data Aire



DRAWINGS

1. **DRAWING A1.11 – MAIN LEVEL FLOOR PLAN, REFLECTED CEILING PLAN, AND DOOR TYPES**
  - A. Reissued this addendum
2. **DRAWING M1 – MECHANICAL DEMOLITION AND NEW WORK PLAN**
  - A. Reissued this addendum

END OF ADDENDUM #2

## **SECTION 23 09 93**

### **BAS SEQUENCE OF OPERATIONS**

#### **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. This Section includes control sequences for HVAC systems, subsystems, and equipment.
- B. Related Sections include the following:
  - 1. Division 23 Section "Building Automation System" for control equipment and devices and for submittal requirements.

##### **1.03 DEFINITIONS**

- A. DDC: Direct digital control.
- B. VAV: Variable air volume.

##### **1.04 CONTROL SEQUENCES**

- A. Refer to the attached control sequences and points schedule for required Building Automation Systems work.

**PART 2:** PRODUCTS (Not Applicable)

**PART 3:** EXECUTION (Not Applicable)

## **CONTROL SEQUENCE AND POINTS SCHEDULE**

### **FOR: VAV Boxes with Terminal Reheat**

#### **1. GENERAL**

- A. Control Sequences for Variable Air Volume with terminal reheat are included in this section.
- B. Provide the electronic VAV box control module and floating point damper motor to the VAV box manufacturer for mounting at the factory.
- C. The VAV box manufacturer will install and wire the electronic VAV box control module and damper motor, and connect air flow sensor to the control module at the factory.
- D. Provide a flat-plate type space sensor for each VAV box and wire it to the respective control module.
- E. Provide control valves and actuators for the reheat coil (RH) and finned tube radiation (FTR), where applicable; refer to equipment schedule for valve type and control. Installation of control valve is work of another DIV 23 specification section.
- F. Provide a separate heating, cooling setpoint for each VAV box. Each setpoint shall be individually adjustable from the front end computer graphic.
- G. Provide leaving air temperature sensor at VAV box outlet.

#### **2. CONTROL SEQUENCES**

##### **A. Morning Warm-up Cycle**

- 1. The air handling unit control module shall broadcast a signal to the respective VAV boxes that a "warm-up" cycle is in progress. See control sequence for air handling units under "Optimal Start/Morning Warm-up".
- 2. Each VAV box shall be assigned a warm-up cycle CFM setpoint and shall maintain that setpoint.
- 3. The reheat coil valves shall be full open.
- 4. As the zone occupied temperature setpoints are satisfied the respective reheat coil valves shall modulate towards closed position.

##### **B. Occupied Mode**

###### **1. Cooling**

- a. The VAV boxes shall be indexed to occupied mode by the EMCS.
- b. The maximum/minimum CFM flow rates shall be software adjustable.
- c. The space temperature setpoint shall be definable in the software.
- d. As the space temperature rises above cooling setpoint, the VAV box damper shall be modulated from minimum towards open position.
- e. When the VAV box is in full cooling and the space is still calling for cooling, a "cooling request" shall be transmitted over the network to the respective air-handling unit. This message shall reset the discharge air temperature as described under the air handling unit control sequence.

- f. When the space is satisfied and calling for less cooling, the VAV box damper shall modulate towards minimum position.
- g. When the VAV box damper is in minimum cooling and the space is still calling for less cooling, a "heating request" shall be transmitted over the network to the respective air-handling unit. This message shall reset the discharge air temperature as described under the air handling unit control sequence.
- h. The VAV box shall operate to maintain the free cooling setpoint when air handler is in economizer mode. Refer to the air handler sequences.

## 2. Heating

- a. The VAV boxes shall remain in cooling mode unless the "heating available" signal has been broadcast over the network by the central plant control module. VAV boxes shall then be indexed to the heating mode by the EMCS.
- b. As the space temperature drops below heating setpoint, the reheat coil valve shall modulate towards open position and the VAV box airflow control shall modulate open.
- c. When the VAV box is in full heating and the space is still calling for heating, a "heating request" shall be transmitted over the network to the respective air-handling unit. This message shall reset the discharge air temperature as described under the air handling unit control sequence.
- d. When the VAV box is in minimum heating and the space is still calling for cooling, the VAV box damper shall be modulated towards open position.
- e. On a further call for cooling, a "cooling request" shall be transmitted over the network to the respective air-handling unit. This message shall reset the discharge air temperature as described under the air handling unit control sequence.

## C. Unoccupied Mode

### 1. Cooling

- a. The VAV boxes are indexed to unoccupied mode by the EMCS.
- b. The VAV box reheat coil valves are closed.
- c. The "cooling requests" from various zones are ignored by the system and no action is taken.

### 2. Heating

- a. When the space temperature drops below the unoccupied setpoint, a "heating request" shall be transmitted over the network to the respective air-handling unit.
- b. When the number of heating requests exceeds an operator definable number, the air handling unit shall start with the outside air and relief air dampers fully closed, return air dampers fully open, and the heating coil valve closed.
- c. The VAV boxes shall operate as described in "Morning Warm-up Cycle" (see above).
- d. When the heating requests are satisfied, the air-handling unit shall be turned off.

### 3. ALARMS

- A. Generate an alarm when the space temperature is 5°F above the occupied/unoccupied cooling temperature setpoint.
- B. Generate an alarm when the space temperature is 5°F below the occupied/unoccupied heating temperature setpoint.

### 4. POINT SCHEDULE

Provide at a minimum the following control points for each system and as required to accomplish the control sequences indicated.

(AI)	VAV Box CFM	(AO)	Minimum Heating CFM Setpoint
(AO)	VAV Box Damper Modulation	(AO)	Maximum Heating CFM Setpoint
(AI)	VAV Box Damper Position	(AO)	Minimum Cooling CFM Setpoint
(AO)	RH Coil Valve Modulation	(AO)	Maximum Cooling CFM Setpoint
(AI)	Space Temperature	(AO)	Morning Warm-up CFM Setpoint
(AI)	Leaving Air Temperature	(DO)	Heating Space Temperature Setpoint
(AO)	Radiation Valve Modulation	(DO)	Cooling Space Temperature Setpoint

## **CONTROL SEQUENCE AND POINTS SCHEDULE**

**FOR: Radiation**

### **1. GENERAL**

- A. Provide a flat-plate type temperature sensor and control sequence for each piece of radiation.
- B. Provide heating control valves and electric valve actuators; installed as work of another Division 23 Section.
- C. The radiation shall be indexed between their occupied unoccupied modes by a timeclock schedule through the Building Automation System.

### **2. CONTROL SEQUENCE**

- A. Occupied Mode
  - 1. On a call for heating, the radiation valves shall open 25% (operator adjustable) before the heating coil valve begins to modulate. On a continued call for heat, the reheat valve shall modulate in unison with the radiation valve to maintain a temperature setpoint of 72.0 degrees.
- B. Unoccupied Mode
  - 1. On a call for heating from the space temperature sensor, the heating valve shall modulate open to maintain a space temperature setpoint of 55.0 degrees.

### **3. ALARMS**

- A. Generate an alarm when the space temperature drops 5°F below setpoint for a 5-minute duration in the heating mode.

### **4. POINT SCHEDULE**

Provide at a minimum the following control points for each system and as required to accomplish the control sequences indicated.

- (AI) Space Temperature
- (AO) Reheat Valve Modulation
- (AO) Radiation Valve Modulation

## CONTROL SEQUENCE AND POINTS SCHEDULE

FOR: *Existing Cabinet Unit Heaters*

### 1. GENERAL

- A. ~~Provide a flat plate type temperature sensor and control sequence for each cabinet unit heater. *The existing cabinet unit heater is to be relocated as indicated on the drawings. It is the intent that the control of the unit heater remain as existing. Field verify existing controls prior to bidding to provide work and material necessary to restore all control sequences and operations.*~~
- B. ~~Provide heating control valves and electric valve actuators; installed as work of another Division 23 Section. Cabinet unit heater valves are typically 2-way modulating. *Extend control wiring from the existing temperature sensor as necessary. Conceal new control wiring in the existing wall.*~~
- C. ~~Provide and wire a surface mounted aquastat; mounted as work of another Division 23 Section. *Modify and replace the communication network for the existing unit heater controller as necessary. Conceal new control wiring in the existing wall.*~~
- D. ~~The unit heaters shall be indexed between its occupied and unoccupied modes by a timeclock schedule through the EMCS system.~~

### 2. CONTROL SEQUENCE *(The following sequence is suggested. Review the existing control sequence and provide a report to the engineer).*

#### E. Occupied Mode

- 1. On a call for heat from a space temperature sensor, the heating valve shall modulate open, to maintain a temperature setpoint of 70.0 degrees.
- 2. An aquastat mounted on the return hot water line shall de-energize fan motor when fluid temperature falls below setpoint of aquastat (adjustable). The aquastat and the space temperature call for heat shall be wired in series such that the unit heater fan will run only if there is a call for heat and there is hot water available in the system.

#### F. Unoccupied Mode

- 1. On a call for heat from a space temperature sensor, the heating valve shall modulate open to maintain a temperature setpoint of 55.0 degrees.
- 2. An aquastat mounted on the return hot water line shall de-energize fan motor when fluid temperature falls below setpoint of aquastat (adjustable). The aquastat and the space temperature call for heat shall be wired in series such that the unit heater fan will run only if there is a call for heat and there is hot water available in the system.

### 3. ALARMS

- A. Generate an alarm when space temperature drops 5°F below setpoint for 5-minute duration in heating mode.

### 4. POINTS SCHEDULE

Provide at a minimum the following control points for each system and as required to accomplish the control sequences indicated.

- (AI) Space Temperature
- (AO) Heating Valve Modulation



## **CONTROL SEQUENCE AND POINTS SCHEDULE**

### **FOR: Computer Room Air Conditioning Units**

#### **1. GENERAL**

- A. The Computer Room units RC-1 and RC-2 are rack mounted evaporator sections mounted in the space with remote condensing units. Refer to the drawings for quantity and location.
- B. All controls are provided with the units by another Division 23 Section including remote mounted rack temperature sensors. The Building Automation System contractor shall install and wire all controls as required for the complete operation of the unit. Coordinate requirements with Division 23 contractor. Refer to Specification 23 81 23 for additional information.
- C. Provide BACnet interface connection to the rack mounted cooling systems to remotely monitor system operation and alarms. Coordinate requirements with the computer room cooling unit manufacturer.
- D. Provide a space temperature sensor in addition to information provided through BACnet interface to remotely monitor the space temperature.

#### **2. CONTROL SEQUENCE**

- A. All controls provided by another Division 23 section. There is no control sequence associated with this equipment.

#### **3. ALARMS**

- A. Generate an alarm if the space temperature is greater than 5°F above setpoint for a period greater than 30 minutes.
- B. Provide monitoring of system alarms through the unit BACnet interface to include at a minimum the following:
  - 1. High return air temperature
  - 2. Low return air temperature
  - 3. Loss of power
  - 4. Low voltage
  - 5. Airflow
  - 6. Filter
  - 7. Compressor low pressure
  - 8. Compressor high pressure

#### **4. POINTS SCHEDULE**

Provide at a minimum the following control points and as required to accomplish the control sequences indicated. The points indicated are in addition to the BACnet interface.

- (AI) Space Temperature

**END OF SECTION 23 09 93**

## SECTION 23 82 33

### HEATING TERMINAL UNITS

#### PART 1: GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 SUMMARY

- A. This Section includes the following:

1. Finned tube radiation.
2. Cabinet heaters.

##### 1.03 QUALITY ASSURANCE

- A. Codes and Standards:

1. I=B=R Compliance: Test and rate baseboard and finned tube radiation in accordance with I=B=R, provide published ratings bearing emblem of I=B=R.
2. ARI Compliance: Provide coil ratings in accordance with ARI Standard 410 "Forced-Circulation Air-Cooling and Air-Heating Coils".
3. ASHRAE Compliance: Test coils in accordance with ASHRAE Standard 33 "Methods of Testing Forced Circulation Air Cooling and Heating Coils".
4. ARI Compliance: Test and rate fan-coil units in accordance with ARI Standard 440 "Room Fan-Coil Air-Conditioners".
5. UL Compliance: Construct and install fan-coil units in compliance with UL 883 "Safety Standards for Fan Coil Units and Room Fan Heater Units.
6. ARI Compliance: Test and rate unit ventilators in accordance with ARI Standard 330 "Unit Ventilators".
7. UL Compliance: Provide electrical components for terminal units, which have been listed and labeled by UL.

##### 1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications for terminal units showing dimensions, capacities, ratings, performance characteristics, gages and finishes of materials, and installation instructions.
- B. Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, construction details, and field connection details.
- C. Wiring Diagrams submit manufacturer's electrical requirements for power supply wiring to terminal units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

- D. Maintenance Data: Submit maintenance instructions, including lubrication instructions, filter replacement, motor and drive replacement, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals in accordance with requirements of Division 1.

### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Handle terminal units and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged terminal units or components; replace with new.
- B. Store terminal units and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- C. Comply with Manufacturer's rigging and installation instructions for unloading terminal units, and moving them to final location.
- D. Deliver terminal units to job site tagged with label indicating project name, model number, unit number, and details of installation (i.e. room number orientation, etc.).

## **PART 2: PRODUCTS**

### **2.01 FINNED TUBE RADIATION**

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering finned tube radiation which may be incorporated in the work include the following:
  - 1. Sterling Radiator, Div. of Reed National Corp.
  - 2. Trane (The) Co.
  - 3. Vulcan Radiator Co.
  - 4. Rittling.
  - 5. Dunham Bush.
  - 6. Sigma Corporation.
- B. General: Provide finned tube radiation of lengths and in locations as indicated, and of capacities, style, and having accessories as scheduled.
- C. Cabinets: Minimum 18-ga cold-rolled steel full backplate, minimum 16-ga front. Brace and reinforce front minimum of 4'-0" o.c. without visible fasteners.
- D. Elements: Copper tube and aluminum fins, with tube mechanically expanded into fin collars to eliminate noise and ensure durability and performance at scheduled ratings.
- E. Finish: Factory finished baked enamel, standard colors as selected by the Architect, on fronts and accessories.
- F. Accessories:
  - 1. End panels, inside and outside corners, and enclosure extensions.
  - 2. Access panels in front of valves, balancing cocks, and traps.
  - 3. Sill extensions.
  - 4. Mullion channels.
  - 5. Pilaster covers.

## 2.02 CABINET HEATERS

A. ~~Manufacturer: Subject to compliance with requirements, provide cabinet heaters of one of the following:~~

1. ~~Airtherm Mfg. Co.~~
2. ~~Dunham Bush, Inc.~~
3. ~~McQuay, Inc.~~
4. ~~Trane (The) Co.~~
5. ~~Young Radiator Co.~~
6. ~~Vulcan Radiator Corp.~~
7. ~~Modine Mfgr. Co.~~
8. ~~Sterling Radiator Co.~~
9. ~~Rittling~~
10. ~~Sigma Corporation.~~

B. ~~General: Provide cabinet heaters having cabinet sizes and in locations as indicated, and of capacities, style, and having accessories as scheduled. Include in basic unit chassis, coil, fanboard, fan wheels, housings, motor, motor starter switch and insulation.~~

C. ~~Coil Section Insulation: Comply with NFPA 90A or NFPA 90B. Unicellular polyethylene thermal plastic, preformed sheet insulation complying with ASTM C 534, Type II, except for density.~~

1. ~~Thickness: 3/4 inch.~~
2. ~~Thermal Conductivity (k Value): 0.24 Btu x in./h x sq. ft. at 75 deg F mean temperature.~~
3. ~~Fire Hazard Classification: Maximum flame spread index of 25 and smoke developed index of 50 when tested according to ASTM C 411.~~
4. ~~Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.~~

D. ~~Cabinet: Steel with baked enamel finish with manufacturer's standard paint, in color selected by Architect, baked enamel finish with manufacturer's custom paint, in color selected by Architect.~~

1. ~~Vertical Unit, Exposed Front Panels: Minimum 0.0528 inch thick, sheet steel, removable panels with channel formed edges secured with tamperproof cam fasteners.~~
2. ~~Horizontal Unit, Exposed Bottom Panels: Minimum 0.0528 inch thick, sheet steel, removable panels secured with tamperproof cam fasteners and safety chain.~~
3. ~~Recessing Flanges: Steel, finished to match cabinet.~~
4. ~~Control Access Door: Key operated.~~
5. ~~Base: Minimum 0.0528 inch thick steel, finished to match cabinet, 6 inches high with leveling bolts.~~
6. ~~Extended Piping Compartment: 8 inch wide piping end pocket.~~
7. ~~False Back: Minimum 0.0428 inch thick steel, finished to match cabinet.~~

E. ~~Filters: Minimum arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.~~

1. ~~Glass Fiber Treated with Adhesive: 80 percent arrestance and 5 MERV.~~

~~F. Hot Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 200 psig and a maximum entering water temperature of 220 deg F. Include manual air vent and drain.~~

~~G. Fan and Motor Board: Removable.~~

~~1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted steel wheels, and aluminum, painted steel, or galvanized steel fan scrolls.~~

~~2. Wiring Terminations: Connect motor to chassis wiring with plug connection.~~

### 2.03 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment", including, but not limited to, efficiency and power factor correction requirements.

1. Permanently lubricated, multi-speed, resiliently mounted. For cabinet unit heaters, connect motor to chassis wiring with plug connection.

## PART 3: EXECUTION

### 3.01 INSPECTION

A. Examine areas and conditions under which terminal units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

### 3.02 INSTALLATION OF FINNED TUBE RADIATION

A. General: Install finned tube radiation as indicated, and in accordance with manufacturer's installation instructions.

B. Center elements under windows. Where multiple windows occur over units, divide element into equal segments centered under each window.

C. Install units level and plumb.

D. Install enclosure continuously around corners, using outside and inside corner fittings.

E. Join sections with splice plates and filler pieces to provide continuous enclosure.

F. Install access doors for access to valves.

G. Install enclosure continuously from wall to wall unless otherwise shown on the drawings.

H. Terminate enclosures with manufacturer's end caps, except where enclosures are indicated to extend to adjoining walls.

I. Install valves within reach of access door provided in enclosure.

J. Install piping within pedestals for freestanding units.

### ~~3.03 INSTALLATION OF CABINET HEATERS~~

~~A. General: Install cabinet heaters as indicated, and in accordance with manufacturer's installation instructions.~~

~~B. Locate cabinet heaters as indicated, coordinate with other trades to assure correct recess size for recessed units.~~

~~C. Install units plumb and level.~~

~~D. Install piping as indicated.~~

~~E. Protect units with protective covers during balance of construction.~~

### **3.04 CONNECTIONS**

- A. Piping installation requirements are specified in Division 23 Section "Hydronic Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect hot-water units and components to piping according to Division 23 Section "Hydronic Piping."
  - 1. Install shutoff valves on inlet and outlet, and balancing valve on outlet.
- C. Install control valves as required by Division 23 Section "Building Automation System."
- D. Install piping adjacent to convection heating units to allow service and maintenance.

### **3.05 ELECTRICAL WIRING**

- A. General: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electric Installer.
  - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and requirements of Division-26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

### **3.06 ADJUSTING AND CLEANING**

- A. General: After construction is completed, including painting, clean unit exposed surfaces, vacuum clean terminal coils and inside of cabinets.
- B. Retouch any marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.
- C. Install new filter units for terminals requiring it.

### **3.07 DEMONSTRATION AND TRAINING**

- A. Provide demonstration and training for Owner's representative in accordance with Division 1 Section "Demonstration and Training."

**END OF SECTION 23 82 33**