DEPARTMENT OF VETERANS AFFAIRS

Justification and Approval

For

Other Than Full and Open Competition

1. **Contracting Activity:**
   Department of Veterans Affairs
   Lebanon VA Medical Center
   1700 S. Lincoln Ave.
   Lebanon, PA   17042

2. **Nature and/or Description of the Action Being Processed:**
   Contractor shall furnish management, supervision, labor transportation, equipment, and materials, and perform work to include general construction, alterations, mechanical and electrical work, and certain other items as required by project drawings and specifications for:
   PROJECT NO. #595-CSI-004
   VACO – LEBANON VA MEDICAL CENTER
   RENOVATION OF MAIN LABORATORY – B1
   This acquisition is a firm-fixed price construction buy.

3. **Description of Supplies/Services Required to Meet the Agency's Needs:**

   a. HVAC Controls – Delta Controls – DIRECT DIGITAL CONTROL SYSTEM FOR HVAC CONTROLS: Engineering, programming, controls and installation materials, installation labor, commissioning and start-up, training.

   > **PART 2 – PRODUCTS**
   > **2.1   PRODUCTS**
   >   A.   Delta Controls, provided and installed by an authorized Delta Controls partner.
   > **2.2   CONTROLS SYSTEM ARCHITECTURE**
   >   A. General
   >   1. The Controls Systems shall consist of multiple Nodes and associated equipment connected by industry standard digital and communication network arrangements.
   >   2. The Operator Workstations, Servers and principal network computer equipment shall be standard products of recognized major manufacturers available through normal PC and computer vendor channels – not "Clones" assembled by a third-party subcontractor.
   >   3. Provide licenses for all software residing on and used by the Controls Systems and transfer these licenses to the Government prior to completion.
   >   4. The networks shall, at minimum, comprise, as necessary, the following:
   >   a. Operator Workstations – fixed and portable as required by the Specifications.

b. Network computer processing, data storage and communication equipment including Servers and digital data processors.

c. Routers, bridges, switches, hubs, modems, interfaces and the like communication equipment.

d. Active processing network area controllers connected to programmable field panels and controllers together with their power supplies and associated equipment.

e. Addressable elements, sensors, transducers and end devices.

f. Third-party equipment interfaces as required by the Contract Documents.

g. Other components required for a complete and working Control Systems as specified.

B. The Specifications for the individual elements and component subsystems shall be minimum requirements and shall be augmented as necessary by the Contractor to achieve both compliance with all applicable codes, standards and to meet all requirements of the Contract Documents.

C. Network Architecture

1. The Controls Systems Application network shall utilize an open architecture capable of each and all of the following:

   a. Utilizing standard Ethernet communications and operate at a minimum speed of 10/100 Mb/sec.

   b. Connecting via BACNET with ANSI/ASHRAE Standard 135.

2. The networks shall utilize only copper and optical fiber communication media as appropriate and shall comply with applicable codes, ordinances and regulations.

3. All necessary telephone lines, ISDN lines and internet Service Provider services and connections will be provided by the Government.

D. Third Party Interfaces:

1. The Controls Systems shall include necessary hardware, equipment and software to allow data communications between the Controls Systems and building systems supplied by other trades.

2. The other manufacturers and contractors supplying other associated systems and equipment will provide their necessary hardware, software and start-up at their cost and will cooperate fully with the Controls Contractor in a timely manner and at their cost to ensure complete functional integration.

E. Servers:

1. Provide Controls Systems Application Server(s) to archive historical data including trends, alarm and event histories and transaction logs.

2. Equip these Server(s) with the same software Tool Set that is located in the Network Area Controllers for system configuration and custom logic definition and color graphic configuration.

3. Access to all information on the Controls Systems Server(s) shall be through the same browser Operator Interface functionality used to access individual nodes. When logged onto a Server the Operator will be able to also interact with any other NAC on the Controls As required for the functional operation of the Controls Systems, the Controls Contractor shall provide all necessary digital processor programmable Server(s). These Server(s) shall be utilized for Controls Systems Application configuration, for archiving, reporting and trending of data, for Operator transaction archiving and reporting, for network

information management, for alarm annunciation, for Operator Interface tasks, for Controls Application management and the like. These Server(s) shall utilize IT industry standard data base platforms such as Microsoft SQL Server and Microsoft Data Engine (MSDE) or approved equal.

2.3 DIRECT DIGITAL CONTROLLERS

A. (NAC) Network Area Controllers shall be stand-alone, multi-tasking, multi-user, real-time digital processor complete with all hardware, software, and communications interfaces, power supplies. The Controls System shall be designed and implemented entirely for use and operation on the Internet. NACs shall have access to data within the industry standard IT network to the Data Server and other NACs as needed to accomplish required global control strategies.

1. NACs shall provide both standalone and networked direct digital control of mechanical and electrical building system controllers as required by the Specifications. The primary NAC shall support a minimum of [5,000] field points together with all associated features, sequences, schedules, applications required for a fully functional distributed processing operation.

2. NACs shall monitor and report communication status to the Controls Systems Application. The Controls Systems shall provide a system advisory upon communication failure and restoration.

3. All NACs on the network shall be equipped with all software functionality necessary to operate the complete user interface, including graphics, via a Browser connected to the Node on the network or directly via a local port on the NAC.

4. All NAC shall be provided with face mounted LED type annunciation to continually display its operational mode, power and communications.

5. The controllers shall reside on the BACnet Ethernet (ISO 8802-3) local area network and provide Read (Initiate) and Write (Execute) services as defined in Clauses 15.5 and 15.8, respectively of ASHRAE Standard 135, to communicate BACnet objects. Objects supported shall include: Analog input, analog output, analog value, binary input, binary output, binary value, and device.

6. Each NAC shall be provided with the necessary un-interruptible power facilities to ensure its continued normal operation during periods of line power outages of, at minimum, 1-minute duration. Normal functionality shall include all normal software processing, communication with powered field devices and network communications with other powered Controls Systems NAC, Data Servers and OWS. Each NAC shall report its communication status to the Application. The Application shall provide a system advisory upon communication failure and restoration. Each NAC shall retain program, control algorithms, and setpoint information in non-volatile memory in the event of a power failure, and shall return to normal operation upon restoration of power.

7. Each NAC shall have sufficient memory to support its operating system, database, and program requirements, including the following:
   a. Device and network management.
   b. Data sharing.
   c. Alarm and event management including custom alarm messages for each level alarm for the points noted in the I/O Schedule.
   d. Energy management.
   e. Historical trend data for points specified.

        f. Maintenance report.

        g. Scheduling.

        h. Dial up and network communications.

        i. Manual override monitoring.

8. Each NAC shall support firmware upgrades without the need to replace hardware and shall have a minimum of 15 percent spare capacity of secondary system controllers, point capacity and programming functions.

9. Each NAC shall continuously perform self-diagnostics, communication diagnosis, and provide both local and remote annunciation of any detected component failures, low battery condition; and upon failure shall assume the predetermined failure mode.

10. Each NAC shall monitor the status of all overrides and inform the operator that automatic control has inhibited, and allow the operator to manually override automatic or centrally executed command.

11. Provide the capability to generate and modify the Controls Systems Application software-based sequences, database elements, associated operational definition information and user-required revisions to same at any designated Workstation together with the means to download same to the associated System Controllers.

12. In the event of loss of normal power, there shall be orderly shut down of the controllers to prevent the loss of database or software programming. When power is restored flash memory, battery backup or super capacitor will be automatically loaded into non-volatile flash memory and shall be incorporated for all programming data.

B. Auxiliary Control Units (ACUs) shall be stand-alone, multi-tasking, multi-user, real time digital processor complete with all hardware, software and communication interfaces, power supplies, and input/output modular devices.

1. ACUs shall reside on the BACnet ms/tp network.2.   All ACUs shall be provided with LED type annunciation to continually display its operational mode, power and communications.

2. Each ACU shall have sufficient memory to support its operating system, database including the following:

        a. Data sharing.

        b. Device and network management.

        c. Alarm and event management.

        d. Scheduling.

        e. Energy Management.

3. Each ACU shall support firmware upgrades without the need to replace hardware and shall have a minimum of 15 percent spare capacity of I/O functions. The type of spares shall be in the same proportion as the implemented functions on the controller, but in no case there shall be less than one point of each implemented I/O type.

4. Each ACU shall continuously perform self-diagnostics, communication diagnosis, and provide both local and remote annunciation of any detected component failures, low battery condition; and upon failure shall assume the predetermined failure mode.

5. In the event of loss of normal power, there shall be orderly shut down of the controllers to prevent the loss of database or software programming. When

power is restored flash memory, battery backup or super capacitor will be automatically loaded into non-volatile flash memory and shall be incorporated for all programming data.

C. Unitary Control Units (UCUs) shall be microprocessor-based. They shall be capable of stand-alone operation, continuing to provide stable control functions if communication is lost with the rest of the system.

1. Unitary Control Units shall reside on the BACnet ms/tp network.
2. Each UCU shall have sufficient memory to support its own operating system, including data sharing.
3. All UCUs shall be provided with LED type annunciation to continually display its operational mode, power and communications.
4. In the event of loss of normal power, there shall be orderly shut down of the controllers to prevent the loss of database or software programming. When power is restored flash memory, battery backup or super capacitor will be automatically loaded into non-volatile flash memory and shall be incorporated for all programming data.

D. Provide I/O module that connects sensors and actuators onto the field bus network for use by the direct digital controllers. I/O devices shall support the communication technology specified for each controller.

1. Analog input shall allow the monitoring of low voltage (0-10 VDC), current (4-20 ma), or resistance signals (thermistor, RTD). Analog input shall be compatible with, and field configurable to commonly available sensing devices. Analog output shall provide a modulating signal for these control devices.
2. Binary inputs shall allow the monitoring of on/off signals from remote devices. Binary inputs shall provide a wetting current of at least 12 milliamps to be compatible with commonly available control devices. Binary outputs shall provide on/off operation, or a pulsed low voltage signal for pulse width modulation control. Outputs shall be selectable for either normally open or normally closed operation.
3. Binary outputs on remote and auxiliary controllers shall have 3-position (on/off/auto) override switches and status lights. Analog outputs on remote and auxiliary controllers shall have status lights and a 2-position (auto/manual) switch and manually adjustable potentiometer for manual override.
4. Each output point shall be provided with a light emitting diode (LED) to indicate status of outputs.

E. Communication Ports:

1. NACs controllers in the DDC systems shall be connected in a system local area network using protocol defined by ASHRAE Standard 135, BACnet protocol.
2. The control supplier shall provide connectors, repeaters, hubs, and routers necessary for inter-network communication.
3. Minimum baud rate between the peer-to-peer controllers in the system LAN shall be maintained at the rate of 10 Mbps. Minimum baud for the low level controllers between UCUs and ACUs, ACUs and NAC's shall be maintained at the rate of 76 Kbps.
4. Provide RS-232 port with DB-9 or RJ-11 connector for communication with each controller that will allow direct connection of standard printers, operator terminals, modems, and portable laptop operator's terminal. Controllers shall

allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers or terminals.

5. Database, such as points; status information, reports, system software, custom programs of any one controller shall be readable by any other controller on the network.

F. Electric Outlet: Provide a single phase, 120 VAC electrical receptacles inside or within 2 meters (6 feet) of the NAC and ACU enclosures for use with test equipment.

G. Spare Equipment:

1. Provide spare digital controller (CU) boards and spare I/O boards as required. It shall be possible for trained hospital personnel to replace CU boards and load software via the Laptop computer or the ECC.

2. Provide a minimum of one spare digital controller board of each type and associated parts including batteries to make at least one complete set of DDC control equipment spares.

3. If I/O boards are separate from the CU boards, provide two spare I/O boards for each spare CU board provided above.

2.4   DIRECT DIGITAL CONTROLLER SOFTWARE

A. The software programs specified in this section shall be commercially available, concurrent, multi-tasking operating system and support the use of software application that operates under DOS or Microsoft Windows.

B. All points shall be identified by up to 30-character point name and 16-character point descriptor. The same names shall be used at the operator workstation.

C. All control functions shall execute within the stand-alone control units via DDC algorithms. The VA shall be able to customize control strategies and sequences of operations defining the appropriate control loop algorithms and choosing the optimum loop parameters.

D. All CU's shall be capable of being programmed to utilize stored default values for assured fail-safe operation of critical processes. Default values shall be invoked upon sensor failure or, if the primary value is normally provided by the central or another CU, or by loss of bus communication. Individual application software packages shall be structured to assume a fail-safe condition upon loss of input sensors. Loss of an input sensor shall result in output of a sensor-failed message at the ECC workstation. Each ACU and RCU shall have capability for local readouts of all functions. The UCUs shall be read remotely.

E. All DDC control loops shall be able to utilize any of the following control modes:

1. Two position (on-off, slow-fast) control.
2. Proportional control.
3. Proportional plus integral (PI) control.
4. Proportional plus integral plus derivative (PID) control. All PID programs shall automatically invoke integral wind up prevention routines whenever the controlled unit is off, under manual control of an automation system or time initiated program.
5. Automatic tuning of control loops.

F. System Security: Operator access shall be secured using individual password and operator's name. Passwords shall restrict the operator to the level of object, applications, and system functions assigned to him. A minimum of six (6) levels of security for operator access shall be provided.

G. Application Software: The CUs shall provide the following programs as a minimum for the purpose of optimizing energy consumption while maintaining comfortable environment for occupants. All application software shall reside and run in the system digital controllers. Editing of the application shall occur at the operator workstation or via a portable workstation, when it is necessary, to access directly the programmable unit.

1. Economizer: An economizer program shall be provided for VAV systems. This program shall control the position of air handler relief, return, and outdoors dampers. If the outdoor air dry bulb temperature and humidity fall below changeover set point the energy control center will modulate the dampers to provide 100 percent outdoor air. The operator shall be able to override the economizer cycle and return to minimum outdoor air operation at any time.

2. Night Setback/Morning Warm up Control: The system shall provide the ability to automatically adjust set points for this mode of operation.

3. Optimum Start/Stop (OSS): Optimum start/stop program shall automatically be coordinated with event scheduling. The OSS program shall start HVAC equipment at the latest possible time that will allow the equipment to achieve the desired zone condition by the time of occupancy, and it shall also shut down HVAC equipment at the earliest possible time before the end of the occupancy period and still maintain desired comfort conditions. The OSS program shall consider both outside weather conditions and inside zone conditions. The program shall automatically assign longer lead times for weekend and holiday shutdowns. The program shall poll all zones served by the associated AHU and shall select the warmest and coolest zones. These shall be used in the start time calculation. It shall be possible to assign occupancy start times on a per air handler unit basis. The program shall meet the local code requirements for minimum outdoor air while the building is occupied. Modification of assigned occupancy start/stop times shall be possible via operator's workstation.

4. Event Scheduling: Provide a comprehensive menu driven program to automatically start and stop designated points or a group of points according to a stored time. This program shall provide the capability to individually command a point or group of points. When points are assigned to one common load group it shall be possible to assign variable time advances/delays between each successive start or stop within that group. Scheduling shall be calendar based and advance schedules may be defined up to one year in advance. Advance schedule shall override the day-to-day schedule. The operator shall be able to define the following information:
   a. Time, day.
   b. Commands such as on, off, auto.
   c. Time delays between successive commands.
   d. Manual overriding of each schedule.
   e. Allow operator intervention.

5. Alarm Reporting: The operator shall be able to determine the action to be taken in the event of an alarm. Alarms shall be routed to the appropriate workstations based on time and events. An alarm shall be able to start programs, login the event, print and display the messages. The system shall allow the operator to prioritize the alarms to minimize nuisance reporting and

to speed operator's response to critical alarms. A minimum of six (6) priority levels of alarms shall be provided for each point.

6. Remote Communications: The system shall have the ability to dial out in the event of an alarm to workstations and alpha-numeric pagers. The alarm message shall include the name of the calling location, the device that generated the alarm, and the alarm message itself. The operator shall be able to remotely access and operate the system using dial up communications. Remote access shall allow the operator to function the same as local access.

7. Maintenance Management (PM): The program shall monitor equipment status and generate maintenance messages based upon the operators defined equipment run time, starts, and/or calendar date limits. A preventative maintenance alarm shall be printed indicating maintenance requirements based on pre-defined run time. Each preventive message shall include point description, limit criteria and preventative maintenance instruction assigned to that limit. A minimum of 480-character PM shall be provided for each component of units such as air handling units.

2.5 SENSORS (AIR, WATER AND STEAM)

A. Temperature and Humidity Sensors:

1. Electronic Sensors: Provide all remote sensors as required for the systems. All sensors shall be vibration and corrosion resistant for wall, immersion, and/or duct mounting.

   a. Temperature Sensors: Thermistor type for terminal units and Resistance Temperature Device (RTD) with an integral transmitter type for all other sensors.

      1) Duct sensors shall be rigid or averaging type as shown on drawings. Averaging sensor shall be a minimum of 1 linear ft of sensing element for each sq ft of cooling coil face area.

      2) Immersion sensors shall be provided with a separable well made of stainless steel, bronze or monel material. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.

      3) Space sensors shall be equipped with set-point adjustment, override switch, display, and/or communication port as shown on the drawings. Match room thermostats, locking cover.

      4) Room temperature sensors shall incorporate CO_2 sensor.

      5) Outdoor air temperature sensors shall have watertight inlet fittings and be shielded from direct sunlight.

      6) Room security sensors shall have stainless steel cover plate with insulated back and security screws.

      7) Wire: Twisted, shielded-pair cable.

      8) Output Signal: 4-20 ma.

   b. Humidity Sensors: Bulk polymer sensing element type.

      1) Duct and room sensors shall have a sensing range of 20 to 80 percent with accuracy of ± 2 to ± 5 percent RH, including hysteresis, linearity, and repeatability.

      2) Outdoor humidity sensors shall be furnished with element guard and mounting plate and have a sensing range of 0 to 100 percent RH.

      3) 4-20 ma continuous output signal.

   c. Static Pressure Sensors: Non-directional, temperature compensated.

1) 4-20 ma output signal.
2) 0 to 5 inches wg for duct static pressure range.
3) 0 to 0.25 inch wg for Building static pressure range.

B. Water flow sensors:
1. Type: Insertion vortex type with retractable probe assembly and 2 IN full port gate valve.
   a. Pipe size: 3 to 24 IN.
   b. Retractor: ASME threaded, non-rising stem type with hand wheel.
   c. Mounting connection: 2 IN 150 PSI flange.
   d Sensor assembly: Design for expected water flow and pipe size.
   e. Seal: Teflon (PTFE).
2. Controller:
   a. Integral to unit.
   b. Locally display flow rate and total.
   c. Output flow signal to BMCS: Digital pulse type.
3. Performance:
   a. Accuracy: 1.0% of reading
   b. Repeatability: 0.15% of reading
   c. Turndown: 20:1
   d. Response time: Adjustable from 1 to 100 seconds.
   e. Power: 24 volt DC
4. Manufacturer: Emco V-Bar 910 or Onicon
5. Install flow meters according to manufacturer's recommendations. Where recommended by manufacturer because of mounting conditions, provide flow rectifier.

C. Water Flow Sensors:
1. Sensor shall be insertion turbine type with turbine element, retractor and preamplifier/transmitter mounted on a two-inch full port isolation valve; assembly easily removed or installed as a single unit under line pressure through the isolation valve without interference with process flow; calibrated scale shall allow precise positioning of the flow element to the required insertion depth within plus or minute 1 mm (0.05 inch); wetted parts shall be constructed of stainless steel. Operating power shall be nominal 24 VDC. Local instantaneous flow indicator shall be LED type in NEMA 4 enclosure with 3-1/2 digit display, for wall or panel mounting.
2. Performance characteristics:
   a. Ambient conditions: -40 to 60 degrees C (-40 to 140 degrees F), 5 to 100 percent humidity.
   b. Operating conditions: 850 kPa (125 psig), 0 to 120 degrees C (30 to 250 degrees F), 0.15 to 12 m per second (0.5 to 40 feet per second) velocity.
   c. Nominal range (turn down ratio): 10 to 1.
   d. Overall accuracy plus or minus one percent of reading.
   e. Repeatability: plus or minus 0.25 percent of reading.
   f. Preamplifier mounted on meter shall provide 4-20 ma divided pulse output or switch closure signal for units of volume or mass per a time base. Signal transmission distance shall be a minimum of 1,800 meters (6,000 feet). Preamplifier for bi-directional flow measurement shall provide a directional contact closure from a relay mounted in the preamplifier.

g. Pressure Loss: Maximum 1 percent of the line pressure in line sizes above 100 mm (4 inches).

h. Ambient temperature effects, less than 0.005 percent calibrated span per degree C (degree F) temperature change.

i. RFI effect - flow meter shall not be affected by RFI.

j. Power supply effect less than 0.02 percent of span for a variation of plus or minus 10 percent power supply.

D. Steam Flow Sensor/Transmitter:

1. Sensor: Vortex shedder incorporating wing type sensor and amplification technology for high signal-to-noise ratio, carbon steel body with 316 stainless steel working parts, 24 VDC power, NEMA 4 enclosure.

a. Ambient conditions, -40 to 80 degrees C (-40 to 175 degrees F).

b. Process conditions, 900 kPa (125 psig) saturated steam.

c. Turn down ratio, 20 to 1.

d. Accuracy, plus or minus 1.0 percent of span.

e. Repeatability, plus or minus 0.1 percent.

f. Output signal, 4-20 ma DC.

g. Processor/Transmitter, NEMA 4 enclosure with keypad program selector and six digit LCD output display of instantaneous flow rate or totalized flow, solid state switch closure signal shall be provided to the nearest DDC panel for totalization.

1) Ambient conditions, -20 to 50 degrees C (0-120 degrees F), 0 95 percent non-condensing RH.

2) Power supply, 120 VAC, 60 hertz or 24 VDC.

3) Internal battery, provided for 24-month retention of RAM contents when all other power sources are removed.

h. Sensor on all steam lines shall be protected by pigtail siphons installed between the sensor and the line, and shall have an isolation valve installed between the sensor and pressure source.

E. Flow switches:

1. Shall be either paddle or differential pressure type.

a. Paddle-type switches (liquid service only) shall be UL Listed, SPDT snap-acting, adjustable sensitivity with NEMA 4 enclosure.

b. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap acting, NEMA 4 enclosure, with scale range and differential suitable for specified application.

F. Current Switches: Current operated switches shall be self powered, solid state with adjustable trip current as well as status, power, and relay command status LED indication. The switches shall be selected to match the current of the application and output requirements of the DDC systems.

2.6 CONTROL CABLES

As specified in Division 26.

2.7 THERMOSTATS AND HUMIDISTATS

A. Room thermostats controlling heating and cooling devices shall have three modes of operation (heating - null or dead band - cooling). Wall mounted thermostats shall have polished or brushed aluminum finish, setpoint range and temperature display and external adjustment:

1. Electronic Thermostats: Solid-state, microprocessor based, programmable to daily, weekend, and holiday schedules.
   a. Public Space Thermostat: Public space thermostat shall be a platinum sensor and shall not have a visible means of set point adjustment. Adjustment shall be via the digital controller to which it is connected.
   b. Individual Office Room Thermostats: Platinum sensor with set point adjustment and an indicator.
   c. Battery replacement without program loss.
   d. Room thermostats shall incorporate CO_2 sensors.

B. Strap-on thermostats shall be enclosed in a dirt-and-moisture proof housing with fixed temperature switching point and single pole, double throw switch.

C. Freezestats shall have a minimum of 300 mm (one linear foot) of sensing element for each 0.093 square meter (one square foot) of coil area. A freezing condition at any increment of 300 mm (one foot) anywhere along the sensing element shall be sufficient to operate the thermostatic element.

D. Room Humidistats: Provide fully proportioning humidistat with adjustable throttling range for accuracy of settings and conservation. The humidistat shall have set point scales shown in percent of relative humidity located on the instrument. Systems showing moist/dry or high/low are not acceptable.

2.8 FINAL CONTROL ELEMENTS AND OPERATORS

A. Fail Safe Operation: Control valves and dampers shall provide "fail safe" operation in either the normally open or normally closed position as required for freeze, moisture, and smoke or fire protection.

B. Spring Ranges: Range as required for system sequencing and to provide tight shut-off.

C. Power Operated Control Dampers (other than VAV Boxes): Factory fabricated, balanced type dampers. All modulating dampers shall be opposed blade type and gasketed. Blades for two-position, duct-mounted dampers shall be parallel, airfoil (streamlined) type for minimum noise generation and pressure drop.
   1. Leakage: maximum leakage in closed position shall not exceed 7 L/S (15 CFMs) differential pressure for outside air and exhaust dampers and 200 L/S/ square meter (40 CFM/sq. ft.) at 50 mm (2 inches) differential pressure for other dampers.
   2. Frame shall be galvanized steel channel with seals as required to meet leakage criteria.
   3. Blades shall be galvanized steel or aluminum, 200 mm (8 inch) maximum width, with edges sealed as required.
   4. Bearing shall be nylon, bronze sleeve or ball type.
   5. Hardware shall be zinc-plated steel. Connected rods and linkage shall be non-slip. Working parts of joints shall be brass, bronze, nylon or stainless steel.

D. Operators shall be electric type operating at 140 kPa (20 psig) as required for proper operation.
   1. See drawings for required control operation.
   2. Metal parts shall be aluminum, mill finish galvanized steel, or zinc plated steel or stainless steel.
   3. Maximum air velocity and pressure drop through free area the dampers:
      a. Smoke damper in air handling unit; 210 meter per minute (700 fpm).
      b. Duct mounted damper; 600 meter per minute (2000 fpm).

    c. Maximum static pressure loss, 50 Pascal (0.20 inches water gage).

  E. Smoke Dampers and Combination Fire/Smoke Dampers: Dampers and operators are specified in Section 23 31 00, HVAC DUCTS AND CASINGS. Control of these dampers is specified under this Section.

  F. Control Valves:

    1. Valves shall be rated for a minimum of 150 percent of system operating pressure at the valve location but not less than 900 kPa (125 psig).

    2. Valves 50 mm (2 inches) and smaller shall be bronze body with threaded or flare connections.

    3. Valves 60 mm (2 1/2 inches) and larger shall be bronze or iron body with flanged connections.

    4. Brass or bronze seats except for valves controlling media above 100 degrees C (210 degrees F), which shall have stainless steel seats.

    5. Flow characteristics:

      a. Three way valves shall have a linear relation or equal percentage relation of flow versus value position.

      b. Two-way valves position versus flow relation shall be linear for steam and equal percentage for water flow control.

    6. Maximum pressure drop:

      a. Two position steam control: 20 percent of inlet gauge pressure.

      b. Modulating Steam Control: 80 percent of inlet gauge pressure (acoustic velocity limitation).

      c. Modulating water flow control, greater of 3 meters (10 feet) of water or the pressure drop through the apparatus.

      d. Two position water valves shall be line size.

  G. Damper and Valve Operators and Relays:

    1. Electronic damper operators: VAV Box actuator shall be mounted on the damper axle or shall be of the air valve design, and shall provide complete modulating control of the damper. The motor shall have a closure torque of 35-inch pounds minimum with full torque applied at close off to attain minimum leakage.

2.9 AIR FLOW CONTROL

  A. Airflow and static pressure shall be controlled via digital controller (CUs) with inputs from airflow control measuring stations and static pressure inputs as specified. Controller outputs shall be true analog output signals variable frequency drives. Pulse width modulation outputs are not acceptable. The CUs shall include the capability to control via simple proportional (P) control, proportional plus integral (PI), proportional plus integral plus derivative (PID), and on-off. The airflow control programs shall be factory-tested programs that are documented in the literature of the control manufacturer.

  B. Air Flow Measuring Station -- Electronic Thermal Type:

    1. Air Flow Sensor Probe:

      a. Each air flow sensor shall contain two individual thermal sensing elements. One element shall determine the velocity of the air stream while the other element shall compensate for changes in temperature. Each thermal flow sensor and its associated control circuit and signal conditioning circuit shall be factory calibrated and be interchangeable to allow replacement of a sensor without recalibration of the entire flow station. The sensor in the

array shall be located at the center of equal area segment of the duct and the number of sensors shall be adequate to accommodate the expected velocity profile and variation in flow and temperature. The airflow station shall be of the insertion type in which sensor support structures are inserted from the outside of the ducts to make up the complete electronic velocity array.

b. Thermal flow sensor shall be constructed of hermetically sealed thermistors or nickel chromium or reference grade platinum wire, wound over an epoxy, stainless steel or ceramic mandrel and coated with a material suitable for the conditions to be encountered. Each dual sensor shall be mounted in an extruded aluminum alloy strut.

2. Air Flow Sensor Grid Array:

a. Each sensor grid shall consist of a lattice network of temperature sensors and linear integral controllers (ICs) situated inside an aluminum casing suitable for mounting in a duct. Each sensor shall be mounted within a strut facing downstream of the airflow and located so that it is protected on the upstream side. All wiring shall be encased (out of the air stream) to protect against mechanical damage.

b. The casing shall be made of welded aluminum of sufficient strength to prevent structural bending and bowing. Steel or iron composite shall not be acceptable in the casing material.

c. Pressure drop through the flow station shall not exceed 4 Pascal (0.015" W.G.) at 1,000 meter per minute (3,000 FPM).

3. Electronics Panel:

a. Electronics Panel shall consist of a surface mounted enclosure complete with solid-state microprocessor and software.

b. Electronics Panel shall be A/C powered 24 VAC and shall have the capability to transmit signals of 0-5 VDC, 0-10 VCD or 4-20 ma for use in control of the HVAC Systems. The electronic panel shall have the capability to accept user defined scaling parameters for all output signals.

c. Electronics Panel shall have the capability to digitally display airflow in CFM and temperature in degrees F . The displays shall be provided as an integral part of the electronics panel. The electronic panel shall have the capability to totalize the output flow in CFM for two or more systems, as required. A single output signal may be provided which will equal the sum of the systems totalized. Output signals shall be provided for temperature and airflow. Provide remote mounted air flow or temperature displays where indicated on the plans.

d. Electronics Panel shall have the following:

1) Minimum of 12-bit A/D conversion.
2) Field adjustable digital primary output offset and gain.
3) Airflow analog output scaling of 100 to 10,000 FPM.
4) Temperature analog output scaling from -45 to 70 degrees C (-50 to 160 degrees F).
5) Analog output resolution (full scale output) of 0.025%.

e. All readings shall be in I.P. units.

4. Thermal flow sensors and its electronics shall be installed as per manufacturer's instructions. The probe sensor density shall be as follows:

Probe Sensor Density	
Area (sq.ft.)	Qty. Sensors
<=1	2
>1 to <4	4
4 to <8	6
8 to <12	8
12 to <16	12
>=16	16

        a. Complete installation shall not exhibit more than ± 2.0% error in airflow measurement output for variations in the angle of flow of up to 10 percent in any direction from its calibrated orientation. Repeatability of readings shall be within ± 0.25%.

C. Static Pressure Measuring Station:

    1. Static Pressure Control:

        a. Systems shall consist of one or more static pressure sensors and transmitters along with relays or auxiliary devices as required for a complete functional system. The span of the transmitter shall not exceed two times the design static pressure at the point of measurement. The output of the transmitter shall be true representation of the input pressure with plus or minus 25 Pascal (0.1 inch) W.G. of the true input pressure.

            1) Static pressure sensors shall have the same requirements as Airflow Measuring Devices except that total pressure sensors are optional, and only multiple static pressure sensors positioned on an equal area basis connected to a network of headers are required.

            2) For systems with multiple major trunk supply ducts, furnish a static pressure transmitter for each trunk duct. The transmitter signal representing the lowest static pressure shall be selected and this shall be the input signal to the CU.

            3) The CU shall receive the static pressure transmitter signal and CU shall provide a control output signal to the supply fan capacity control device. The control mode shall be proportional plus integral (PI) (automatic reset) and where required shall also include derivative mode.

            4) In systems with multiple static pressure transmitters, provide a switch located near the fan discharge to prevent excessive pressure during abnormal operating conditions.

D. Airflow Synchronization:

1. Systems shall consist of an air flow measuring station for each supply and return duct, the CU and such relays, as required to provide a complete functional system that will maintain a constant flow rate difference between supply and return air to an accuracy of ±10%. In systems where there is no suitable location for a flow measuring station that will sense total supply or return flow, provide multiple flow stations with a differential pressure transmitter for each station. Signals from the multiple transmitters shall be added through the CU such that the resultant signal is a true representation of total flow.

2. The total flow signals from supply and return air shall be the input signals to the CU. This CU shall track the return air fan capacity in proportion to the supply air flow under all conditions.

4. **Statutory Authority Permitting Other than Full and Open Competition:**
   (X) (1) Only One Responsible Source and No Other Supplies or Services Will Satisfy Agency Requirements per FAR 6.302-1;
   ( ) (2) Unusual and Compelling Urgency per FAR 6.302-2;
   ( ) (3) Industrial Mobilization, Engineering, Developmental or Research Capability or Expert Services per FAR 6.302-3;
   ( ) (4) International Agreement per FAR 6.302-4
   ( ) (5) Authorized or Required by Statute FAR 6.302-5;
   ( ) (6) National Security per FAR 6.302-6;
   ( ) (7) Public Interest per FAR 6.302-7;

5. **Demonstration that the Contractor's Unique Qualifications or Nature of the Acquisition Requires the Use of the Authority Cited Above (applicability of authority):**
   a. HVAC Controls – Delta Controls or Johnson – DIRECT DIGITAL CONTROL SYSTEM FOR HVAC CONTROLS: Restriction of sources for this acquisition is justified in accordance with FAR 6.302-1. Although there are other manufacturers of HVAC controls, those controls are not compatible with the systems currently in place in the medical center (Delta or Johnson). Delta controls is being implemented at the facility. The change is being made at the facility for ease of use and ability to provide the most efficient environmental conditions throughout the buildings on station, including the hospital. The existing Johnson controls are useable by only one operator at the facility and in his absence there is no back up. However, in the interest of generating competition, Johnson controls are acceptable for this project. The changeover to Delta controls and the use of Delta Controls will meet the operational need of the Lebanon VAMC, by giving the engineering department redundant HVAC operational control. Use of other manufacturers would lead to storing additional inventory, functioning issues due to non compatibility with existing equipment, multiplicity of service contracts, and increased training and operator requirements.

6. **Description of Efforts Made to ensure that offers are solicited from as many potential sources as deemed practicable:**

The AE designing this project made every effort to specify generic items, however in design process only the products listed above meet the unique design criteria of this construction project. There is no restriction on

suppliers of the products specified, only on the manufacturer. While these products are specified, most can be procured from multiple sources.

7. **Determination by the Contracting Officer that the Anticipated Cost to the Government will be Fair and Reasonable:**

It is anticipated that the prime construction contractor will obtain multiple quotes from various suppliers for the specified items, thus ensuring fair and reasonable price determination.

8. **Description of the Market Research Conducted and the Results, or a Statement of the Reasons Market Research Was Not Conducted:**

No market research was conducted as the prime contractor for these products is responsible for purchase/procurement of specified products. It is anticipated that prime construction contractor will be able to obtain price competition for these items.

9. **Any Other Facts Supporting the Use of Other than Full and Open Competition:**

These items are specified as design criteria to complete a unique atmosphere and work environment. Deviation from these products would jeopardize the aesthetic feel and functionality of the design.
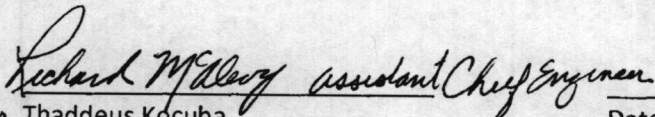
10. **Listing of Sources that Expressed, in Writing, an Interest in the Acquisition:**

See Section VI above.

11. **A Statement of the Actions, if any, the Agency May Take to Remove or Overcome any Barriers to Competition before Making subsequent acquisitions for the supplies or services required**:
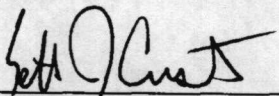
The products specified for this construction project are the only products that meet the Government's needs for the specified design. There is no restriction on suppliers of the products specified, only on the manufacturer. In the future the VA will continue to urge AE design firms to write specifications that allow for more diverse product placement and less restrictive requirements.

12. Requirements Certification: I certify that the requirement outlined in this justification is a Bona Fide Need of the Department of Veterans Affairs and that the supporting data under my cognizance, which are included in the justification, are accurate and complete to the best of my knowledge and belief.

Richard M'Elroy _assistant Chief Engineer_   Date _March 14, 2012_

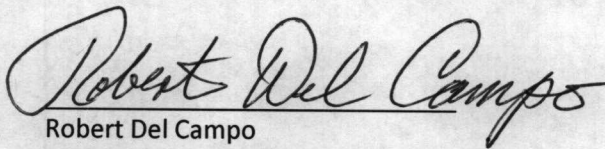for Thaddeus Kocuba
Chief of Engineering
Lebanon VA Medical Center

13. Approvals in accordance with FAR 6.304

a. **Contracting Officer's Certification (required):** I certify that the foregoing justification is accurate and complete to the best of my knowledge and belief.

Seth J Custer _____   _3/14/12_
Seth J. Custer   Date
Chief of Contracting
Lebanon VA Medical Center

b. **Network Contracting Manager's Delegate Certification (required):** I certify that the foregoing justification is accurate and complete to the best of my knowledge and belief.

Robert Del Campo ___   _14 MARCH 2012_
Robert Del Campo   Date
Construction Team Manager
NCO 4