SECTION 10 2800

TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Toilet Room Accessories.

B. Electric Powered Hand Dryers

C. Bathroom Mirrors

D. Utility Room Accessories.

1.02 RELATED SECTIONS

A. Section 06100 Rough Carpentry

B. Section 06114 - Wood Blocking and Curbing.

C. Section 09 2116 - Gypsum Board Assemblies.

D. Section 09 3000 - Tiling.

E. Section 10170 Plastic toilet compartments

F. Section 09900 Paints and coatings

G. Section 10 2113.13 - Metal Toilet Compartments.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's product data for products specified, indicating selected options and accessories.

C. Shop Drawings:
   1. Plans: Locate each specified unit in project.
   2. Elevations: Indicate mounting height of each specified unit in project.
   3. Details: Indicate anchoring and fastening details, required locations and types of anchors and reinforcement, and materials required for correct installation of specified products not supplied by manufacturer of products of this section.

D. Quality Assurance Submittals:
   1. Manufacturer's printed installation instructions for each specified product.
   2. Documentation of manufacturer's qualifications, specified in QUALITY ASSURANCE Article of this section.

E. Closeout Submittals: Warranty documents, issued and executed by manufacturer of products of this section, and countersigned by Contractor.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum five (5) years of documented experience producing products of the types specified in this section.

B. Regulatory Requirements: Conform to ADAAG requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Factory-apply strippable protective vinyl coating to sight-exposed surfaces after finishing of products; ship products in manufacturer's standard protective packaging.

B. Storage and Protection: Store products in manufacturer's protective packaging until installation.

1.06 SEQUENCING

A. Supply locating and sizing templates, and other requirements, to fabricators and installers of products referenced in RELATED SECTIONS Article for building in products of this section.

B. Supply reinforcing and anchoring devices required for installation of products of this section to fabricators and installers of products referenced in RELATED SECTIONS Article.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's standard warranty against defects in product workmanship and materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: ASI-American Specialties, Inc; 441 Saw Mill River Road, Yonkers NY 10701-9986; Telephone (914) 476-9000, FAX (914) 476-0688.

B. Acceptable Manufacturers:
   1. Global; www.globalpartitions.com.
   2. Bobrick; www.bobrick.com.

C. Substitutions: Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Stainless Steel Sheet: ASTM A 240/A 240M, Type 304, 18-8 alloy.

B. Cabinet Collars: Fabricated from 0.0313 inch (0.79 mm) stainless steel sheet, finish matching cabinet finish; welded corners, finished to match sheet finish.

2.03 PROFILE SERIES 9000 CABINET-TYPE ACCESSORIES

A. Basic Construction Requirements:
   1. Doors: Fabricated from single sheet 0.06 inch (1.52 mm) stainless steel, formed 15/16 inch (24 mm) return to wall, with vertical edges eased at 3/4 inch (19 mm) radius; welded corners, finished to match sheet finish.
   2. Cabinets: Fabricated from 0.050 inch (1.27 mm) stainless steel sheet, formed 1 inch (25 mm) wide flat perimeter trim four sides; all joints welded, sight-exposed welds finished to match sheet finish.
   3. Hinges: Stainless steel piano hinge, 3/16 inch (5 mm) diameter barrel, full length of cabinet; hinge leaves spot-welded to door and cabinet body.
   4. Locks: Flat rimless tumbler locks, keyed alike other toilet accessory locks, with two keys for each lock.
   5. Cabinet and Door Finish: No.4 satin stainless steel.

B. Products
   1. Single Robe Hook; TA-3, Model 7308
   2. Utility Shelf / Mop Strip; TA-07, Model 1308
   3. Sanitary Waste Receptacle; TA-09A, Model 20852
   4. Sanitary Napkin Disposal; TA-9B, Model 20472
   5. Baby Chnaging Station; TA-08, Model 9013
   6. Paper Towel Dispenser; TA-11, Model 0215

2.04 MIRRORS

A. Manufacturer: Electric Mirror, www.electricmirror.com

B. Products:
   1. Novo Lighted Mirror; TA-6, Model NOV-28.00x36.00
      a. Size 28 x 36 x 2 inch
      b. Power: 120 - 277 VAC, .70 - .28 Amps, 78W
      c. Lamping: 2 x T5HO, 39W
      d. See drawings for mouting heights & locations

2.05 GRAB BARS

A. Grab Bars - Basic Requirements: Fabricated to comply with ASTM F 446 and to withstand a 900 pound (4 000 N) force, from ASTM A 554 stainless steel tubing, 0.050 inch (1.27 mm), Type 304, 18-8 alloy; formed 1-1/2 inch (38 mm) radius return to wall at each end; each end heliarc-welded to minimum 11 gage stainless steel circular flange; welds finished to match tube finish.

B. Grab Bars TA-4A (36 inch), TA-4B (42 inch) and TA-4C (18 inch vertical): Series 3100.
   1. Peened finish.
   2. Concealed fasteners.
   3. Sizes and configurations: As indicated on drawings.

2.06 ELECTRICAL ACCESSORIES

A. Electric Hand Dryer TA-1: Model XLERATOR Hand Dryers - XL-SB.
   1. Brushed Stainless Steel
   2. Surface Mounted
   3. Automatic Operation
   4. Die-cast chrome-plated air nozzle with 360-degree rotation.
   5. Brushless electric motor rated 1/8 horsepower (93.2 W), 3200 revolutions per minute.
   6. Heating element rated 1700 watts.
   7. Fan capacity 153 cubic feet per minute (64 L/s).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
   1. Prepared openings are sized and located in accordance with shop drawings.
   2. Reinforcement and anchoring devices are correct type and are located in accordance with shop drawings.

B. Installer's Examination:
   1. Have installer of this section examine conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable.
   2. Transmit two copies of installer's report to Architect within 24 hours of receipt.
   3. Beginning construction activities of this section before unacceptable conditions have been corrected is prohibited.
   4. Beginning construction activities of this section indicates installer's acceptance of conditions.

3.02 INSTALLATION

A. Install toilet accessories plumb and level in accordance with shop drawings and manufacturer's printed installation instructions.

B. Locate toilet accessories at heights specified by Americans with Disabilities Act (ADA).

3.03 CLEANING

A. Remove manufacturer's protective vinyl coating from sight-exposed surfaces 24 hours before final inspection.

B. Clean surfaces in accordance with manufacturer's recommendations.

3.04 PROTECTION OF INSTALLED PRODUCTS

A. Protect products from damage caused by subsequent construction activities.

B. Field repair of damaged product finishes is prohibited; replace products having damaged finishes caused by subsequent construction activities.

END OF SECTION

SECTION 10 7313

AWNINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum framing and fittings.

B. Covering material.

1.02 REFERENCE STANDARDS

A. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2012.

B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

D. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2012.

1.03 DESIGN REQUIREMENTS

A. Awning shall be designed to confrom with all applicable code requirments

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on awning covering, color fastness, stitching and seaming methods, attachment devices to framing system.

C. Shop Drawings: Indicate awning profiles, sizes, connection attachments, anchorage, size and type of fasteners, accessories.

D. Samples, Covering: Submit 12 x 12 inch (300 x 300 mm) sample of covering with representative hem stitch detail, seam with reinforcement, and attachment devices to framing system.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire resistance ratings for awning covering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Awnings:
   1. Perfection Architectural Systems
      a. Alpha Productions; www.alpjaproductions.com
      b. Tri Vantage, LLC.; www.trivantage.com
      c. Steel Stitch Corp.; www.steelstitch.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ALUMINUM FRAMING SYSTEM

A. Framing: 2 inch (____ mm)diameter, tubing, conforming to ASTM B241/B241M.

B. Fittings: Elbows, T-shapes, wall brackets; cast aluminum.

C. Mounting: Brackets and flanges, with aluminum inserts for embedding into masonry.

D. Splice Connectors: Concealed spigot; cast aluminum.

E. Finish Exposed Components: Anodized to see finish schedule color as selected.

2.03 COVERING MATERIALS

A. COVERING OPTIONS, Architect shall review and approved other coverings:

B. Painted Army Duck: 11 oz/sq yd (285 gm/sq m), resistant to ultra-violet light, mildew and water, flame resistant treated; selected by architect color .

C. Vinyl Coated Cotton: 15 oz/sq yd (390 gm/sq m), resistant to ultra-violet light, mildew and water, flame resistant treated; selected by architect color .

D. Vinyl Laminated Polyester: 16 oz/sq yd (415 gm/sq m), resistant to ultra-violet light, mildew and water, flame resistant treated; selected by architect color .

E. Solution Dyed Acrylic: 9.25 oz/sq yd (240 gm/sq m), resistant to ultra-violet and color degradation, mildew and water resistant; selected by architect color .

F. Lacing: Woven nylon.

2.04 FABRICATION - FRAMING

A. Fit and shop assemble components in largest practical sizes, for delivery to site.

B. Fabricate components with joints tightly fitted and secured.

C. Exposed Fastenings: Unobtrusively located; consistent with design of component, except where specifically noted otherwise.

D. Supply components required for anchorage of framing. Fabricate anchors and related components of same material and finish as framing, except where specifically noted otherwise.

E. Continuously seal joined pieces by intermittent welds and plastic filler.

F. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

G. Accurately form components to suit each other and to building structure.

2.05 FABRICATION - COVERING

A. Manufacture covering in one piece wherever possible, sized and configured to suit framing.

B. Form covering heading of triple thickness 2 inches (50 mm) wide, double fold bottom hem 2 inches (50 mm) wide.

C. Prepare covering with grommets for attachment to framing 6 inches (150 mm) on center.

D. Turn seam edges and lock stitch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall substrate anchors are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete with setting templates, to appropriate Sections.

3.03 INSTALLATION - FRAMING

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects.

C. Provide anchors required for connecting framing to structure. Anchor framing to structure.

D. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 INSTALLATION - COVERING

A. Install covering over framing members, stretched taut without creases or folds.

B. Attach covering and fasten securely.

3.05 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.

B. Maximum Misalignment From True Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 23 09 00

AUTOMATIC TEMPERATURE CONTROL SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The Building Automation System (BAS) manufacturer shall furnish and install a fully integrated building automation system, incorporating direct digital control (DDC) for energy management, equipment monitoring and control, and subsystems with open communications capabilities as herein specified.

B. All materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed specially for this project. All systems and components shall have been thoroughly tested and proven in actual use for at least two years.

C. Installing contractor shall be responsible for all BAS and Temperature Control wiring for a complete and operable system. All wiring shall be done in accordance with all local and national codes.

~~C.~~D. CNE has standardized on SE Smartstruxure I/A series controls at all Casinos. All new controls for this project shall seamlessly integrate into this existing system using Workplace Tech software. Entering the password one time shall allow authorized users access to all facilities.

1.2 WORK BY OTHERS

A. Mechanical contractor installs all wells, valves, taps, dampers, flow stations, etc. furnished.

B. Electrical Contractor provides:
   1. Wiring of all power feeds through all disconnect starters to electrical motor.
   2. Wiring of any remote start/stop switches and manual or automatic motor speed control devices not furnished by BAS contractor.
   3. Wiring of any electrical sub-metering devices.

C. Products furnished but not installed under this section
   1. Section 23- Hydronic Piping:
      a. Control Valves
      b. Flow Switches
      c. Temperature Sensor Wells and Sockets
      d. Flow Meters
   2. Section 23 - Refrigerant Piping:
      a. Pressure and Temperature Sensor Wells and Sockets
   3. Section 23 - Duct-work Accessories:
      a. Automatic Dampers
      b. Air-flow Stations
      c. Terminal Unit Controls

D. Products installed but not furnished under this section:
   1. Section 23 - Refrigeration Equipment:

      a. Pressure Transmitters

      b. Temperature Transmitters

c. Power Transmitters

d. Refrigerant Leak Detectors

2. Section 23- Air Handling Equipment:
   a. Thermostats
   b. Sensors
   c. Controllers
3. Section 26 - Fire Alarm Systems

a. Smoke Detectors

1.3 RELATED WORK

A. Division 1 General and Special Conditions
B. Division 23 Mechanical
C. Division 26 Electrical

1.4 QUALITY ASSURANCE

A. The BAS system shall be designed and installed, commissioned and serviced by, factory trained personnel. contractor shall have an in-place support facility within 100 miles of the site with technical staff, spare parts inventory and necessary test and diagnostic equipment.
   1. The installing contractor shall provide full time, on site, experienced project manager for this work, responsible for direct supervision of the design, installation, start up and commissioning of the B.M.S.
   2. The Bidder shall be regularly engaged in the, installation, maintenance of BMS systems and shall have a minimum of ten (10) years of demonstrated technical expertise and experience in the, installation and maintenance of B.M.S. systems similar in size and complexity to this project. A maintained service organization consisting of at least ten (10) competent servicemen for a period of not less than ten years and provide a list of 10 projects, similar in size and scope to this project, completed within the last five years.

B. Materials and equipment shall be the catalogued products of manufacturers regularly engaged in production and installation of automatic temperature control systems and shall be manufacturer's latest standard design that complies with the specification requirements.
C. All BAS peer-to-peer network controllers, central system controllers and local user displays shall be UL Listed under Standard UL 916, category PAZX; Standard ULC C100, category UUKL7; and under Standard UL 864, categories UUKL, UDTZ, and QVAX and be so listed at the time of bid. All floor level controllers shall comply, at a minimum, with UL Standard UL 91 6category PAZX; Standard UL 864, categories UDTZ, and QVAX and be so listed at the time of Bid.
D. DDC peer-to-peer controllers shall be compliant with the European EMC Directive, Standards EN 50081-2 and EN 50082-2, at the Industrial Levels. Additionally the equipment shall be compliant with the European LVD Directive and bear the CE mark in order to show compliance to both Directives."
E. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.
F. The manufacturer of the building automation system shall provide documentation supporting compliance with ISO-9002 (Model for Quality Assurance in Production, Installation, and Servicing) and ISO-140001 (The application of well-accepted business management principles to the environment). The intent of this specification requirement

is to ensure that the products from the manufacturer are delivered through a Quality System and Framework that will assure consistency in the products delivered for this project.

G. This system shall have a documented history of compatibility by design for a minimum of 15 years. Future compatibility shall be supported for no less than 10 years. Compatibility shall be defined as the ability to upgrade existing field panels to current level of technology, and extend new field panels on a previously installed network.
   1. Compatibility shall be defined as the ability for any existing field panel microprocessor to be connected and directly communicate with new field panels without bridges, routers or protocol converters.

H. The building automation system (BAS) shall conform to the following standard for Year 2000 Compliance:
   1. The system shall not produce errors when processing date data (including calculating, sorting or displaying) from, into and between the years 1999 and 2000 and leap year calculations in the year 2000, to the extent that date information provided from other systems, is accurate.
   2. The BAS supplier shall provide documentation to support the individual device(s) Year 2000 Compliance. This document shall include a listing of compliance by device and any exceptions to the above definition.

1.5 SUBMITTALS

A. Submit 10 complete sets of documentation in the following phased delivery schedule:
   1. Valve and damper schedules
   2. Equipment data cut sheets
   3. System schematics, including:
      a. Sequence of operations
      b. Point names
      c. Point addresses
      d. Interface wiring diagrams
      e. Panel layouts.
      f. System riser diagrams
   4. Auto-CAD compatible as-built drawings

B. Upon project completion, submit operation and maintenance manuals, consisting of the following:
   1. Index sheet, listing contents in alphabetical order
   2. Manufacturer's equipment parts list of all functional components of the system, Auto-CAD disk of system schematics, including wiring diagrams
   3. Description of sequence of operations
   4. As-Built interconnection wiring diagrams
   5. Operator's Manual
   6. Trunk cable schematic showing remote electronic panel locations, and all trunk data
   7. List of connected data points, including panels to which they are connected and input device (ionization detector, sensors, etc.)
   8. Conduit routing diagrams

1.6 WARRANTY

A. Provide all services, materials and equipment necessary for the successful operation of the entire BAS system for a period of one year after beneficial use.

B. The adjustment, required testing, and repair of the system includes all computer equipment, transmission equipment and all sensors and control devices.

C. The on-line support services shall allow the local BAS subcontractor to dial out over telephone lines to monitor and control the facility's building automation system. This remote connection to the facility shall be within 2 hours of the time that the problem is reported. This coverage shall be extended to include normal business hours, after business hours, weekends and holidays.

1. If the problem cannot be resolved on-line by the local office, the national office of the building automation system manufacturer shall have the same capabilities for remote connection to the facility. If the problem cannot be resolved with on-line support services, the BAS manufacturer shall dispatch the appropriate personnel to the job site to resolve the problem within 3 hours of the time that the problem is reported.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. ~~ES2 - Automated Logic~~, ABS - Automated Building Systems, Schneider Electric IA Series Controls ~~Alerton (Northwest controls)~~

2.2 NETWORKING COMMUNICATIONS

A. The design of the BAS shall network operator workstations and stand-alone DDC Controllers. The network architecture shall consist of multiple levels for communication efficiency, a campus-wide (Management Level Network) Ethernet network based on TCP/IP protocol, high performance peer-to-peer building level network(s) and DDC Controller floor level local area networks with access being totally transparent to the user when accessing data or developing control programs.

B. The design of BAS shall allow the co-existence of new DDC Controllers with existing DDC Controllers in the same network without the use of gateways or protocol converters.

1. System shall have the capability to communicate with a BACnet network over Ethernet or BACnet/IP (according to Annex J). The intent is to use the system provided under this contract to communicate with control systems provided by other vendors. A PICS must be provided describing the BACnet, ANSI/ASHRAE 135-95, implementation. Minimum system functionality must include monitoring, commanding, and alarming for daily operator functions from a common workstation.
2. System shall have the capability to be an OPC Client and Server for dynamic communication with OPC Clients or Servers over an Ethernet network. At a minimum, the following must be supported:

    a. Data Access 1.0 (96), 1.0A (97) and 2.0 (11/98)
    b. Alarms & Events 1.0 (1/99)

C. Peer-to-Peer Building Level Network:

1. All operator devices either network resident or connected via dial-up modems shall have the ability to access all point status and application report data or execute control functions for any and all other devices via the peer-to-peer network. No hardware or software limits shall be imposed on the number of devices with global access to the network data at any time.
2. The peer-to-peer network shall support a minimum of 100 DDC controllers and PC workstations
3. Each PC workstation shall support a minimum of 4 peer to peer networks hardwired or dial up.
4. The system shall support integration of third party systems (fire alarm, security, lighting, PCL, chiller, boiler) via panel mounted open protocol processor. This processor shall exchange data between the two systems for interprocess

control. All exchange points shall have full system functionality as specified herein for hardwired points.

5. Field panels must be capable of integration with open standards including Modbus, BACnet, and Lonworks as well as with third party devices via existing vendor protocols.

2.3 DDC CONTROLLER FLOOR LEVEL NETWORK

A. This level communication shall support a family of application specific controllers and shall communicate with the peer-to-peer network through DDC Controllers for transmission of global data.

2.4 DDC & HVAC MECHANICAL EQUIPMENT CONTROLLERS

A. The DDC & HVAC Mechanical Equipment Controllers shall reside on the Building Level Network.

B. DDC & HVAC Mechanical Equipment Controllers shall use the same programming language and tools. DDC & HVAC Mechanical Equipment Controllers which require different programming language or tools on a network are not acceptable.

C. DDC & HVAC Mechanical Equipment Controllers which do not meet the functions specified in Section 2.4.1 and Section 2.5 for DDC Controllers or Section 2.4.2 and Section 2.5 for HVAC Mechanical Equipment Controllers are not acceptable.

2.5 DDC CONTROLLER

A. DDC Controllers shall be a 16-bit stand-alone, multi-tasking, multi-user, real-time digital control processors consisting of modular hardware with plug-in enclosed processors, communication controllers, power supplies and input/output point modules. Controller size shall be sufficient to fully meet the requirements of this specification and the attached point I/O schedule. Each controller shall support a minimum of three (3) Floor Level Application Specific Controller Device Networks.

B. Each DDC Controller shall have sufficient memory to support its own operating system and databases, including:

1. Control processes
2. Energy management applications
3. Alarm management applications including custom alarm messages for each level alarm for each point in the system.
4. Historical/trend data for points specified
5. Maintenance support applications
6. Custom processes
7. Operator I/O
8. Dial-up communications
9. Manual override monitoring

C. Each DDC Controller shall support firmware upgrades without the need to replace hardware.

D. Provide all processors, power supplies and communication controllers so that the implementation of a point only requires the addition of the appropriate point input/output termination module and wiring.

E. DDC Controllers shall provide a RS-232C serial data communication ports for operation of operator I/O devices such as industry standard printers, operator terminals, modems and portable laptop operator's terminals. DDC Controllers shall allow temporary use of portable devices without interrupting the normal operation of permanently connected modems, printers or terminals.

F. As indicated in the point I/O schedule, the operator shall have the ability to manually override automatic or centrally executed commands at the DDC Controller via local, point

discrete, on-board hand/off/auto operator override switches for digital control type points and gradual switches for analog control type points.

1. Switches shall be mounted either within the DDC Controllers key-accessed enclosure, or externally mounted with each switch keyed to prevent unauthorized overrides.
2. DDC Controllers shall monitor the status of all overrides and inform the operator that automatic control has been inhibited. DDC Controllers shall also collect override activity information for reports.

G. DDC Controllers shall provide local LED status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device. Graduated intensity LEDs or analog indication of value shall also be provided for each analog output. Status indication shall be visible without opening the panel door.

H. Each DDC Controller shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all panel components. The DDC Controller shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication.

I. Isolation shall be provided at all peer-to-peer network terminations, as well as all field point terminations to suppress induced voltage transients consistent with:

1. RF-Conducted Immunity (RFCI) per ENV 50141 (IEC 1000-4-6) at 3 V
2. Electro Static Discharge (ESD) Immunity per EN 61000-4-2 (IEC 1000-4-2) at 8 kV air discharge, 4 kV contact
3. Electrical Fast Transient (EFT) per EN 61000-4-4 (IEC 1000-4-4) at 500 V signal, 1 kV power
4. Output Circuit Transients per UL 864 (2,400V, 10A, 1.2 Joule max)
5. Isolation shall be provided at all peer-to-peer panel's AC input terminals to suppress induced voltage transients consistent with:
   a. IEEE Standard 587-1980
   b. UL 864 Supply Line Transients
   c. Voltage Sags, Surge, and Dropout per EN 61000-4-11 (EN 1000-4-11)

J. In the event of the loss of normal power, there shall be an orderly shutdown of all DDC Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 60 days.

1. Upon restoration of normal power, the DDC Controller shall automatically resume full operation without manual intervention.
2. Should DDC Controller memory be lost for any reason, the user shall have the capability of reloading the DDC Controller via the local RS-232C port, via telephone line dial-in or from a network workstation PC.

K. Provide a separate DDC Controller for each AHU or other HVAC system as indicated in Section 3.02. It is intended that each unique system be provided with its own point resident DDC Controller.

2.6 HVAC MECHANICAL EQUIPMENT CONTROLLERS

A. HVAC Mechanical Equipment Controllers shall be a 12-bit stand-alone, multi-tasking, multi-user, real-time digital control processors consisting of modular hardware with plug-in enclosed processors.

B. Each HVAC Mechanical Controller shall have sufficient memory to support its own operating system and databases, including:

1. Control processes
2. Energy management applications
3. Alarm management applications including custom alarm messages for each level alarm for each point in the system.
4. Historical/trend data for points specified
5. Maintenance support applications

6. Custom processes
7. Operator I/O
8. Remote communications

C. HVAC Mechanical Equipment Controllers shall provide a RS-232C serial data communication port for operation of operator I/O devices such as industry standard printers, operator terminals, modems and portable laptop operator's terminals.

D. HVAC Mechanical Equipment Controllers shall provide local LED status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device.

E. Each HVAC Mechanical Equipment Controller shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all components. The HVAC Mechanical Equipment Controller shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication.

F. Isolation shall be provided at all peer-to-peer network terminations, as well as all field point terminations to suppress induced voltage transients consistent with:
1. RF-Conducted Immunity (RFCI) per ENV 50141 (IEC 1000-4-6) at 3 V
2. Electro Static Discharge (ESD) Immunity per EN 61000-4-2 (IEC 1000-4-2) at 8 kV air discharge, 4 kV contact
3. Electrical Fast Transient (EFT) per EN 61000-4-4 (IEC 1000-4-4) at 500 V signal, 1 kV power
4. Output Circuit Transients per UL 864 (2,400V, 10A, 1.2 Joule max)

G. Isolation shall be provided at all peer-to-peer panel's AC input terminals to suppress induced voltage transients consistent with:
1. IEEE Standard 587-1980
2. UL 864 Supply Line Transients
3. Voltage Sags, Surge, and Dropout per EN 61000-4-11 (EN 1000-4-11)

H. In the event of the loss of normal power, there shall be an orderly shutdown of all HVAC Mechanical Equipment Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.
1. Upon restoration of normal power, the HVAC Mechanical Equipment Controller shall automatically resume full operation without manual intervention.
2. Should HVAC Mechanical Equipment Controller memory be lost for any reason, the user shall have the capability of reloading the HVAC Mechanical Equipment Controller via the local RS-232C port, via telephone line dial-in or from a network workstation PC.

2.7 DDC & HVAC MECHANICAL EQUIPMENT CONTROLLER RESIDENT SOFTWARE FEATURES

A. General:
1. The software programs specified in this Section shall be provided as an integral part of DDC and HVAC Mechanical Equipment Controllers and shall not be dependent upon any higher level computer for execution.
2. 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 PC workstation.
3. All digital points shall have user defined two-state status indication (descriptors with minimum of 8 characters allowed per state (i.e. summer/winter)).

B. Control Software Description:
1. The DDC and HVAC Mechanical Equipment Controllers shall have the ability to perform the following pre-tested control algorithms:

a. Two-position control

b. Proportional control
c. Proportional plus integral control
d. Proportional, integral, plus derivative control
e. Automatic tuning of control loops

C. DDC and HVAC Mechanical Equipment Controllers shall provide the following energy management routines for the purpose of optimizing energy consumption while maintaining occupant comfort.

1. Start-Stop Time Optimization (SSTO) shall automatically be coordinated with event scheduling. The SSTO program shall start HVAC equipment at the latest possible time that will allow the equipment to achieve the desired zone condition by time of occupancy. The SSTO program shall also shut down HVAC equipment at the earliest possible time before the end of the occupancy period, and still maintain desired comfort conditions.

   a. The SSTO program shall operate in both the heating and cooling seasons.
      1) It shall be possible to apply the SSTO program to individual fan systems.
      2) The SSTO program shall operate on both outside weather conditions as well as inside zone conditions and empirical factors.
   b. The SSTO program shall meet the local code requirements for minimum outside air while the building is occupied.

2. Event Scheduling: Provide a comprehensive menu driven program to automatically start and stop designated points or groups of points according to a stored time.

   a. It shall be possible to individually command a point or group of points.
   b. For points assigned to one common load group, it shall be possible to assign variable time delays between each successive start or stop within that group.
   c. The operator shall be able to define the following information:
      1) Time, day
      2) Commands such as on, off, auto, and so forth.
      3) Time delays between successive commands.
      4) There shall be provisions for manual overriding of each schedule by an appropriate operator.
   d. It shall be possible to schedule events up to one year in advance.
      1) Scheduling shall be calendar based.
      2) Holidays shall allow for different schedules.

3. Enthalpy switchover (economizer) .The Energy Management Control Software (EMCS) will control the position of the air handler relief, return, and outside air dampers. If the outside air dry bulb temperature falls below changeover set point the EMCS will modulate the dampers to provide 100 percent outside air. The user will be able to quickly changeover to an economizer system based on dry bulb temperature and will be able to override the economizer cycle and return to minimum outside air operation at any time.

4. Temperature-compensated duty cycling.

   a. The DCCP (Duty Cycle Control Program) shall periodically stop and start loads according to various patterns.
   b. The loads shall be cycled such that there is a net reduction in both the electrical demands and the energy consumed.

5. Automatic Daylight Savings Time Switchover: The system shall provide automatic time adjustment for switching to/from Daylight Savings Time.

6. Night setback control: The system shall provide the ability to automatically adjust setpoints for night control.

7. The Peak Demand Limiting (PDL) program shall limit the consumption of electricity to prevent electrical peak demand charges.

    a. PDL shall continuously track the amount of electricity being consumed, by monitoring one or more electrical kilowatt-hour/demand meters. These meters may measure the electrical consumption (kWh), electrical demand (kW), or both.
    b. PDL shall sample the meter data to continuously forecast the demand likely to be used during successive time intervals.
    c. If the PDL forecasted demand indicates that electricity usage is likely to exceed a user preset maximum allowable level, then PDL shall automatically shed electrical loads.
    d. Once the demand peak has passed, loads that have been shed shall be restored and returned to normal control.

D. DDC and HVAC Mechanical Equipment Controllers shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.

1. A single process shall be able to incorporate measured or calculated data from any and all other DDC and HVAC Mechanical Equipment Controllers on the network. In addition, a single process shall be able to issue commands to points in any and all other DDC and HVAC Mechanical Equipment Controllers on the network. Database shall support 30 character, English language point names, structured for searching and logs.
2. Processes shall be able to generate operator messages and advisories to operator I/O devices. A process shall be able to directly send a message to a specified device or cause the execution of a dial-up connection to a remote device such as a printer or pager.
3. DDC and HVAC Mechanical Equipment Controller shall provide a HELP function key, providing enhanced context sensitive on-line help with task orientated information from the user manual.
4. DDC and HVAC Mechanical Equipment Controller shall be capable of comment lines for sequence of operation explanation.

E. Alarm management shall be provided to monitor and direct alarm information to operator devices. Each DDC and HVAC Mechanical Equipment Controller shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic and prevent alarms from being lost. At no time shall the DDC and HVAC Mechanical Equipment Controllers ability to report alarms be affected by either operator or activity at a PC workstation, local I/O device or communications with other panels on the network.

1. All alarm or point change reports shall include the point's English language description and the time and date of occurrence.
2. The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of six priority levels shall be provided for each point. Point priority levels shall be combined with user definable destination categories (PC, printer, DDC Controller, etc.) to provide full flexibility in defining the handling of system alarms. Each DDC and HVAC Mechanical Equipment Controller shall automatically inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point.

3. Alarm reports and messages will be directed to a user-defined list of operator devices or PCs based on time (after hour's destinations) or based on priority.
4. In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a 200 character alarm message to more fully describe the alarm condition or direct operator response.
5. In dial-up applications, operator-selected alarms shall initiate a call to a remote operator device.

F. A variety of historical data collection utilities shall be provided to manually or automatically sample, store and display system data for points as specified in the I/O summary.
1. Any point, physical or calculated may be designated for trending. Any point, regardless of physical location in the network, may be collected and stored in each DDC and HVAC Mechanical Equipment Controllers point group. Two methods of collection shall be allowed: either by a pre-defined time interval or upon a pre-defined change of value. Sample intervals of l minute to 7 days shall be provided. Each DDC and HVAC Mechanical Equipment Controller shall have a dedicated RAM-based buffer for trend data and shall be capable of storing a minimum of __ data samples. All trend data shall be available for transfer to a Workstation without manual intervention.
2. DDC and HVAC Mechanical Equipment Controllers shall also provide high resolution sampling capability for verification of control loop performance. Operator-initiated automatic and manual loop tuning algorithms shall be provided for operator-selected PID control loops as identified in the point I/O summary.

a. Loop tuning shall be capable of being initiated either locally at the DDC and HVAC Mechanical Equipment Controller, from a network workstation or remotely using dial-in modems. For all loop tuning functions, access shall be limited to authorized personnel through password protection.

G. DDC and HVAC Mechanical Equipment Controllers shall be capable of automatically accumulating and storing run-time hours for digital input and output points and automatically sample, calculate and store consumption totals for analog and digital pulse input type points, as specified in the point I/O schedule.

H. The peer to peer network shall allow the DDC and HVAC Mechanical Equipment Controllers to access any data from or send control commands and alarm reports directly to any other DDC and HVAC Mechanical Equipment Controller or combination of controllers on the network without dependence upon a central or intermediate processing device. DDC and HVAC Mechanical Equipment Controllers shall send alarm reports to multiple workstations without dependence upon a central or intermediate processing device. The peer to peer network shall also allow any DDC and HVAC Mechanical Equipment Controller to access, edit, modify, add, delete, back up, and restore all system point database and all programs.

I. The peer to peer network shall allow the DDC and HVAC Mechanical Equipment Controllers to assign a minimum of 50 passwords access and control priorities to each point individually. The logon password (at any PC workstation or portable operator terminal) shall enable the operator to monitor, adjust and control the points that the operator is authorized for. All other points shall not be displayed on the PC workstation or portable terminal (e.g. all base building and all tenant points shall be accessible to any base building operators, but only tenant points shall be accessible to tenant building operators). Passwords and priorities for every point shall be fully programmable and adjustable.

2.8 FLOOR LEVEL NETWORK APPLICATION SPECIFIC CONTROLLERS (ASC)

A. Each DDC Controller shall be able to extend its performance and capacity through the use of remote application specific controllers (ASCs) through Floor Level LAN Device Networks.

B. Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor. Each ASC shall be capable of control of the terminal device independent of the manufacturer of the terminal device.

C. Terminal Equipment Controllers:

1. Provide for control of each piece of equipment, including, but not limited to, the following:

    a. Variable Air Volume (VAV) boxes
    b. Constant Air Volume (CAV) boxes
    c. Unit Conditioners
    d. Room Pressurization

2. Controllers shall include all point inputs and outputs necessary to perform the specified control sequences. Analog outputs shall be industry standard signals such as 24V floating control, 3-15 psi pneumatic, 0-10v, allowing for interface to a variety of modulating actuators.

3. All controller sequences and operation shall provide closed loop control of the intended application. Closing control loops over the FLN, BLN or MLN is not acceptable.

2.9 PERSONAL COMPUTER OPERATOR WORKSTATION HARDWARE EXISTING

~~A. Personal computer operator workstation: see drawings~~

~~B.~~A. ~~Alarm Display shall list the alarms with highest priority at the top of the display. The alarm display shall provide selector buttons for display of the associated point graphic and message. The alarm display shall provide a mechanism for the operator to sort alarms.~~

2.10 WORKSTATION OPERATOR INTERFACE EXISTING

A. Fully integrate the new controls into the existing SE BMS located at all Cherokee facilities. One password shall allow access to all new and existing facilities. The existing system is a SE Smartstruxure System using Workplace Tech software. All new controls shall be compatible with Workplace Tech.

B.

~~A.~~C. Basic Interface Description

1. Operator workstation interface software shall minimize operator training through the use of user-friendly and interactive graphical applications, minimum 30-character English language point identification, on-line help, and industry standard Windows application software. Interface software shall simultaneously communicate with and share data between any combination of dedicated, modem autodial, and Ethernet-connected building level networks. The software shall provide, as a minimum, the following functionality:

    a. Real-time graphical viewing and control of the BAS environment
    b. Reporting
    c. Scheduling and override of building operations
    d. Collection and analysis of historical data
    e. Point database editing, storage and downloading of controller databases.

f. Utility for combining points into logical Point Groups. The Point Groups shall then be manipulated in Graphics, trend graphs and reports in order to streamline the navigation and usability of the system.
g. Alarm reporting, routing, messaging, and acknowledgment
h. "Collapsible tree," dynamic system architecture diagram application:
    1) Showing the real-time status and definition details of all workstations and devices on a management level network
    2) Showing the real-time status and definition details of all DDC and HVAC Mechanical Controllers at the building level
    3) Showing the status and definition details of all field-level application controllers
i. Definition and construction of dynamic color graphic displays.
j. Online, context-sensitive help, including an index, glossary of terms, and the capability to search help via keyword or phrase.
k. On-screen access to User Documentation, via online help or PDF-format electronic file.
l. Automatic database backup at the workstation for database changes initiated at DDC Controller operator interface terminals.
m. Display dynamic trend data graphical plot.
    1) Must be able to run multiple plots simultaneously
    2) Each plot must be capable of supporting 10 pts/plot minimum
    3) Must be able to command points directly off dynamic trend plot application.
    4) Must be able to plot both real-time and historical trend data
n. Program editing
o. Transfer trend data to 3rd party spreadsheet software
p. Scheduling reports
q. Operator Activity Log

2. Provide a graphical user interface that shall minimize the use of keyboard through the use of a mouse or similar pointing device, with a "point and click" approach to menu selection and a "drag and drop" approach to inter-application navigation. Selection of applications within the workstation software shall be via a graphical toolbar menu – the application toolbar menu shall have the option to be located in a docked position on any of the four sides of the visible desktop space on the workstation display monitor, and the option to automatically hide itself from the visible monitor workspace when not being actively manipulated by the user.
3. The software shall provide a multi-tasking type environment that allows the user to run several applications simultaneously. BAS software shall run on a current Windows operating system. System database parameters shall be stored within an object-oriented database, which is compliant with the Open Database Connectivity (ODBC) or Structured Query Language (SQL) standards. Standard Windows applications shall run simultaneously with the BAS software. The mouse or Alt-Tab keys shall be used to quickly select and switch between multiple applications. The operator shall be able to work in Microsoft Word, Excel, and other Windows based software packages, while concurrently annunciating on-line BAS alarms and monitoring information
    a. Provide functionality such that any of the following may be performed simultaneously on-line, and in any combination, via adjustable user-sized windows. Operator shall be able to drag and drop information between the following applications, reducing the number of steps to perform a desired function (e.g., Click on a point on the alarm screen and drag it to the dynamic trend graph application to initiate a dynamic trend on the desired point):
        1) Dynamic color graphics application
        2) Alarm management application

3) Scheduling application
4) Dynamic trend graph data plotter application
5) Dynamic system architecture diagram application
6) Control Program and Point database editing applications
7) Reporting applications

b. Report and alarm printing shall be accomplished via Windows Print Manager, allowing use of network printers.

4. Operator-specific password access protection shall be provided to allow the administrator/manager to limit users' workstation control, display and data base manipulation capabilities as deemed appropriate for each user, based upon an assigned password. Operator privileges shall "follow" the operator to any workstation logged onto (up to 999 user accounts shall be supported). The administrator/manager shall be able to grant discrete levels of access and privileges, per user, for each point, graphic, report, schedule, and BAS workstation application. And each BAS workstation user account shall use a Windows 2000/NT user account as a foundation.

a. The workstation software shall also include an application to track the actions of each individual operator, such as alarm acknowledgement, point commanding, schedule overriding, database editing, and logon/logoff. The application shall list each of the actions in a tabular format, and shall have sorting capabilities based on parameters such as ascending or descending time of the action, or name of the object on which the action was performed. The application shall also allow querying based on object name, operator, action, or time range.

5. Dynamic Color Graphics application shall include the following:

a. Must include graphic editing and modifying capabilities
b. A library of standard control application graphics and symbols must be included
c. Must be able to command points directly off graphics application
d. Graphic display shall include the ability to depict real-time point values dynamically with animation, picture/frame control, symbol association, or dynamic informational text-blocks
e. Navigation through various graphic screens shall be optionally achieved through a hierarchical "tree" structure
f. Graphics viewing shall include zoom capabilities
g. Graphics shall automatically display the HAND status of points that have been overridden by a field HAND switch, for points that have been designed to provide a field HAND override capability.
h. Advanced linking within the Graphics application shall provide the ability to navigate to outside documents (e.g., .doc, .pdf, .xls, etc.), internet web addresses, e-mail, external programs, and other workstation applications, directly from the Graphics application window with a mouse-click on a customizable link symbol.

6. Reports shall be generated on demand or via pre-defined schedule, and directed to CRT displays, printers or file. As a minimum, the system shall allow the user to easily obtain the following types of reports:

a. A general listing of all or selected points in the network
b. List of all points currently in alarm
c. List of all points currently in override status
d. List of all disabled points
e. List of all points currently locked out
f. List of user accounts and access levels

g. List all weekly schedules and events
h. List of holiday programming
i. List of control limits and deadbands
j. Custom reports from 3rd party software
k. System diagnostic reports including, list of DDC panels on line and communicating, status of all DDC terminal unit device points
l. List of programs
m. List of point definitions
n. List of logical point groups
o. List of alarm strategy definitions
p. List of DDC Control panels
q. Point totalization report
r. Point Trend data listings
s. Initial Values report
t. User activity report

7. Scheduling and override

a. Provide a calendar type format for simplification of time and date scheduling and overrides of building operations. Schedule definitions reside in the PC workstation, DDC Controller, and HVAC Mechanical Equipment Controller to ensure time equipment scheduling when PC is off-line -- PC is not required to execute time scheduling. Provide override access through menu selection, graphical mouse action or function key. Provide the following capabilities as a minimum:
   1) Weekly schedules
   2) Zone schedules
   3) Event schedules – an event consists of logical combinations of equipment and/or zones
   4) Report schedules
   5) Ability to schedule for a minimum of up to 365 days in advance
b. Additionally, the scheduling application shall:
   1) Provide filtering capabilities of schedules, based on name, time, frequency, and schedule type (event, zone, report)
   2) Provide sorting capabilities of schedules, based on name, time and type of schedule (zone, event, report)
   3) Provide searching capabilities of schedules based on name – with wildcarding options

8. Collection and Analysis of Historical Data

a. Provide trending capabilities that allow the user to easily monitor and preserve records of system activity over an extended period of time. Any system point may be trended automatically at time-based intervals (up to four time-based definitions per point) or change of value, both of which shall be user-definable. Trend data shall be collected stored on hard disk for future diagnostics and reporting. Automatic Trend collection may be scheduled at regular intervals through the same scheduling interface as used for scheduling of zones, events, and reports. Additionally, trend data may be archived to network drives or removable disk media for future retrieval.
b. Trend data reports shall be provided to allow the user to view all trended point data. Reports may be customized to include individual points or predefined groups of selected points. Provide additional functionality to allow predefined groups of up to 250 trended points to be easily transferred on-line to Microsoft Excel. DDC contractor shall provide custom designed spreadsheet reports for use by the owner to track

energy usage and cost, equipment run times, equipment efficiency, and/or building environmental conditions. DDC contractor shall provide setup of custom reports including creation of data format templates for monthly or weekly reports.

c. Provide additional functionality that allows the user to view real-time trend data on trend graphical plot displays. A minimum of ten points may be plotted, of either real-time or historical data. The dynamic graphs shall continuously update point values. At any time the user may redefine sampling times or range scales for any point. In addition, the user may pause the graph and take "snapshots" of plot screens to be stored on the workstation disk for future recall and analysis. Exact point values may be viewed and the graphs may be printed. A minimum of 8 true graphs shall run simultaneously. Operator shall be able to command points directly on the trend plot by double clicking on the point. Operator shall be able to zoom in on a specific time range within a plot. The dynamic trend plotting application shall support the following types of graphs, with option to graph in 3D: line graph, area graph, curve graph, area-curve graph, step graph, and scatter graph. Each graph may be customized by the user, for graph type, graph text, titles, line styles and weight, colors, and configurable x- and y-axes.

~~B.~~D. Dynamic Color Graphic Displays

1. Create color graphic floor plan displays and system schematics for each piece of mechanical equipment, including air handling units, chilled water systems and hot water boiler systems, and room level terminal units, shall be provided by the BAS contractor as indicated in the point I/O schedule of this specification to optimize system performance, analysis and speed alarm recognition.
2. The operator interface shall allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection, point alarm association, or text-based commands. Graphics software shall permit the importing of AutoCAD or scanned pictures for use in the system.
3. Dynamic temperature values, humidity values, flow values and status indication shall be shown in their actual respective locations within the system schematics or graphic floor plan displays, and shall automatically update to represent current conditions without operator intervention and without pre-defined screen refresh rates.
   a. Provide the user the ability to display real-time point values by animated motion or custom picture control visual representation. Animation shall depict movement of mechanical equipment, or air or fluid flow. Picture Control shall depict various positions in relation to assigned point values or ranges. A library (set) of animation and picture control symbols shall be included within the workstation software's graphics application. Animation shall reflect, ON or OFF conditions, and shall also be optionally configurable for up to five rates of animation speed.
   b. Sizable analog bars shall be available for monitor and control of analog values; high and low alarm limit settings shall be displayed on the analog scale. The user shall be able to "click and drag" the pointer to change the setpoint.
   c. Provide the user the ability to display blocks of point data by defined point groups; alarm conditions shall be displayed by flashing point blocks.
   d. Equipment state or values can be changed by clicking on the associated point block or graphic symbol and selecting the new state (on/off) or setpoint.
   e. State text for digital points can be user-defined up to eight characters.

4. Colors shall be used to indicate status and change as the status of the equipment changes. The state colors shall be user definable.
5. The windowing environment of the PC operator workstation shall allow the user to simultaneously view several applications at a time to analyze total building operation or to allow the display of a graphic associated with an alarm to be viewed without interrupting work in progress.
6. Off the shelf graphic software, Microgafx Designer or Corel Draw software, shall be provided to allow the user to add, modify or delete system graphic background displays.
7. A clipart library of HVAC application and automation symbols shall be provided including fans, valves, motors, chillers, AHU systems, standard ductwork diagrams and laboratory symbols. The user shall have the ability to add custom symbols to the clipart library. The clipart library shall include a minimum of 400 application symbols. In addition, a library consisting of a minimum of 700 graphic background templates shall be provided.
8. The Graphics application shall include a set of standard Terminal Equipment controller application-specific background graphic templates. Templates shall provide the automatic display of a selected Terminal Equipment controller's control values and parameters, without the need to create separate and individual graphic files for each controller.

2.11 FIELD DEVICES

A. Provide instrumentation as required for monitoring, control or optimization functions. All devices and equipment shall be approved for installation in the City of New Orleans, Louisiana.

B. Room Temperature Sensors

1. Digital room sensors shall have LCD display, day / night override button, and setpoint slide adjustment override options. The setpoint slide adjustment can be software limited by the automation system to limit the amount of room adjustment.

Temperature monitoring range	+20/120°F -13° to 49°C)
Output signal	Changing resistance
Accuracy at Calibration point	±0.5°F (+/- 0.3°C)
Set Point and Display Range	55° to 95° F (13° to 35°C)

2. Liquid immersion temperature:

Temperature monitoring range	+30/250°F (-1°/121°C)
Output signal	Changing resistance
Accuracy at Calibration point	±0.5°F (+/-0.3°C)

3. Duct (single point) temperature:

Temperature monitoring range	+20/120°F (-7°/49°C)
Output signal	Changing resistance
Accuracy at Calibration point	±0.5°F (+/-0.3°C)

4. Duct Average temperature:

Temperature monitoring range	+20°±120°F(-7°/+49°C)
Output signal	4 – 20 mA DC
Accuracy at Calibration point	±0.5°F (±03°C)
Sensor Probe Length	25' L (7.3m)

5. Outside air temperature:

Temperature monitoring range	-58°±122°F(-50ºCto+50ºC)

Output signal	4 – 20 mA DC
Accuracy at Calibration point	±0.5°F (+/-0.3°C)

C. Liquid Differential Pressure Transmitter:

Ranges	0-5/30 inches H20 0-25/150 inches H20 0-125/750 inches H20
Output	4 – 20 mA DC
Calibration Adjustments	Zero and span
Accuracy	±-0.2% of span
Linearity	±-0.1% of span
Hysteresis	±-0.05% of span

D. Differential pressure:

1. Unit for fluid flow proof shall be Penn P74.

Range	8 to 70 psi
Differential	3 psi
Maximum differential pressure	200 psi
Maximum pressure	325 psi

2. Unit for air flow shall be Siemens Building Technologies SW141.

Set point ranges:	0.5” WG to 1.0” WG	(124.4 to 248.8 Pa)
	1.0” WG to 12.0” WG	(248.8 to 497.6 Pa)

E. Static pressure sensor:

Range

0 to .5” WG (0 to 124.4 Pa)
0 to 1” WG (0 to 248.8 Pa)
0 to 2” WG (0 to 497.7 Pa)
0 to 5” WG (0 to 1.2 kPa
0 to 10” WG (0 to 2.5 kPa)

Output Signal 4 – 20 mA VDC

Combined static error 0.5% full range

Operating Temperature -40º to 175º F (-40C to 79.5ºC)

F. Air Pressure Sensor:

Range:

0 to 0.1 in. water (0 to 24.9 Pa)
0 to 0.25 in. water (0 to 63.2 Pa)
0 to 0.5 in. water (0 to 124.5 Pa)
0 to 1.0 in. water (o to 249 Pa)
0 to 2.0 in water 90 to 498 Pa)
0 to 5.0 in. water (0 to 1.25 kPa)
0 to 10.0 in. water (0 to 2.49 kPa)

Output signal 4 to 20 mA

Accuracy

±1.0% of full scale

G. Humidity Sensors:

Range

0 to 100% RH

Sensing Element

Bulk Polymer

Output Signal 4 – 20 mA DC

Accuracy At 77°F(25ºC) ± 2% RH

H. Flow Meters

½" to 2.5" where 10 pipe diameters of straight, unobstructed pipe is available:

Onicon F-4600 series

1" to 40" where 3 pipe diameters upstream (tees & elbows – valves & expanders is 10 pipe diameters) and 2 pipe diameters downstream of straight, unobstructed pipe is available:

Onicon F 3000 series

1" to 14" where 1.5 diameters up and downstream of straight, unobstructed pipe is available (from the centre of the meter.):

Central Station Steam Co., Cadillac Meter – CMAG

I. Pressure to Current Transducer

Range 3 to 15 psig (21 to 103 kPa) or

3 to 30 psig (21 to 207 kPa)

Output signal 4 – 20 Ma

Accuracy ± 1% of full scale (± 0.3 psig)

J. Control Valves (all control valves shall have electric actuators).

1. Electric Control

Rangeability	40:1
Flow Characteristics	Modified. Equal percentage
Control Action	Normal open or closed as selected
Medium	Steam, water, glycol
Body Type	Screwed ends 2" and smaller, flanged
Valves 2½" and larger	
Body Material	Bronze
Body Trim	Bronze
Stem	Stainless Steel
Actuator	0-10 VDC, 4-20 MA or 2 position

24 VAC/120VAC

2. All automatic temperature control valves in water lines shall be provided with characterized throttling plugs and shall be sized for minimum 25% of the system pressure drop or 5 psi, whichever is less.
   a. Positive positioning relays shall be provided on pneumatic control when required to provide sufficient power for sequencing.
   b. Two position valves shall be line size.

K. Damper Actuators:

1. Electric control shall be Siemens Building Technologies OpenAir™ or Belimo direct coupled actuators or approved equal.

2. Damper actuators shall be Brushless DC Motor Technology with stall protection, bi-directional, fail safe spring return, all metal housing, manual override, independently adjustable dual auxiliary switch.
    a. The actuator assembly shall include the necessary hardware and proper mounting and connection to a standard ½" diameter shaft or damper blade.
3. Actuators shall be designed for mounting directly to the damper shaft without the need for connecting linkages.
4. All actuators having more than 100 lb-in torque output shall have a self-centering damper shaft clamp that guarantees concentric alignment of the actuator's output coupling with the damper shaft. The self-centering clamp shall have a pair of opposed "v" shaped toothed cradles; each having two rows of teeth to maximize holding strength. A single clamping bolt shall simultaneously drive both cradles into contact with the damper shaft.
5. All actuators having more than a 100 lb-in torque output shall accept a 1" diameter shaft directly, without the need for auxiliary adapters.
6. All actuators shall be designed and manufactured using ISO900registered procedures, and shall be Listed under Standards UL873 and CSA22.2 No. 24-93

2.12 MISCELLANEOUS DEVICES

A. Thermostats:
1. Room thermostats shall be of the gradual acting type with adjustable sensitivity.
2. They shall have a bi-metal sensing element capable of responding to a temperature change of one-tenth of one degree. (Provide all thermostats with limit stops to limit adjustments as required.)
3. Thermostats shall be arranged for either horizontal or vertical mounting.
4. In the vertical position thermostat shall fit on a mullion of movable partitions without overlap.
5. Mount the thermostat covers with tamper-proof socket head screws.

B. Freezestats:
1. Install freezestats as indicated on the plans and provide protection for every square foot of coil surface area with one linear foot of element per square foot of coil.
    a. Upon detection of low temperature, the freezestats shall stop the associated supply fans and return the automatic dampers to their normal position. Provide manual reset.

C. Firestats:
1. Provide manual reset, fixed temperature line voltage type with a bi-metal actuated switch.
    a. Switch shall have adequate rating for required load.

D. Current Sensing Relay:
1. Provide solid-state, adjustable, current operated relay. Provide a relay which changes switch contact state in response to an adjustable set point value of current in the monitored A/C circuit.
2. Adjust the relay switch point so that the relay responds to motor operation under load as an "on" state and so that the relay responds to an unloaded running motor as an "off" state. A motor with a broken belt is considered an unloaded motor.
3. Provide for status device for all fans and pumps.

PART 3 - EXECUTION

3.1 PROJECT MANAGEMENT

A. Provide a designated project manager who will be responsible for the following:
   1. Construct and maintain project schedule
   2. On-site coordination with all applicable trades, subcontractors, and other integration vendors
   3. Authorized to accept and execute orders or instructions from owner/architect
   4. Attend project meetings as necessary to avoid conflicts and delays
   5. Make necessary field decisions relating to this scope of work
   6. Coordination/Single point of contact.

3.2 SEQUENCE OF OPERATION

A. AHU:
   1. See design documents.
   2. Provide a time of day schedule for occupied/unoccupied mode.

B. Fan Coil Unit(s):
   1. See design documents.
   2. Provide a time of day schedule for occupied/unoccupied mode.

C. Chilled Water System – Manufactured Plant:
   1. The chilled water system will be enabled when any AHU's are in the occupied mode and the outside air temperature is greater than 53 Degrees F (adjustable). When enabled, the following sequence shall occur:
   2. The chilled water pumps will operate in a lead / lag / standby configuration based on runtime. When the chilled water system is enabled, the lead chilled water pump will be enabled. Should be lead pump fail to provide positive run status proof in 30 seconds (adjustable), the lag pump will be started and an alarm will be sent to the operator workstation. Once the lead pump provides positive status, the lag pump will be shut down. The standby pump shall operate only when both lead and lag pumps are being called for and either pump has failed to provide positive run status proof. The chilled water pump lead / lag / standby pump rotation will be alternated based on runtime to equalize runtime on all pumps.
   3. The lag pump will be enabled when the lead chilled water pump cannot meet chilled water demand for an adjustable period of time.
   4. Once the lead chilled water pump is enabled, the chiller isolation valve shall be opened. Once the isolation valve is opened, the lead chiller shall be enabled. In the event of lead chilled failure (as sensed by the alarm status point), the lag chiller isolation valve shall be opened and the chiller enabled. Once the alarm condition is cleared, the lag chiller will shut down and its isolation valve will close after a 5 minute time delay (adjustable).
   5. The lag chiller will be enabled when the lead chiller cannot meet chilled water demand for an adjustable period of time.
   6. On shutdown of the chilled water system, the chiller(s) operating will be disabled. The isolation valves for each chiller will be closed and chilled water pumps shut down after a 5 minute time delay (adjustable).
   7. The chilled water pumps and chillers will have independent lead lag points to allow any chilled water pumps to operate with any chiller. All lead lag points will alternate based on runtime, with a setpoint of 200 hours (adjustable). Switching of equipment based upon runtime shall happen Monday through Thursday between 11:00 am and 2:00 pm.

D. Hot Water System:
   1. The hot water system will be enabled 24/7.
   2. The lead boiler and hot water pump will be enabled. Once enabled, the hot water valve will modulate to maintain common leaving water temperature based on the following reset schedule:

Outside Air temperature	Building Supply Hot Water Temperature
65 Deg F	120 Deg F
20 Deg F	180 Deg F

(reset schedule shall be user adjustable)

3. The hot water pumps and boilers will operate in a lead / lag configuration based on runtime. When the hot water system is enabled, the lead hot water pump and boiler will be enabled. Should be lead pump fail to provide positive run status proof in 30 seconds (adjustable), the lag pump will be started and an alarm will be sent to the operator workstation. To be similar for boiler enable. The hot water pump and boiler lead / lag rotation will be alternated based on runtime. Heating water pumps and boilers to have independent lead lag points to allow any heating water pump to operate with any boiler.
4. The lag pump and boiler will be enabled when the lead hot water pump and boiler cannot meet hot water demand for a period of 30 minutes (adjustable). Once the lag system is called for, it shall remain enabled for the remainder of the day to prevent excessive lag cycling.

3.3 START-UP AND COMMISSIONING

A. When installation of the system is complete, calibrate equipment and verify transmission media operation before the system is placed on-line. All testing, calibrating, adjusting and final field tests shall be completed by the manufacturer. Verify that all systems are operable from local controls in the specified failure mode upon panel failure or loss of power.
B. Provide any recommendation for system modification in writing to owner. Do not make any system modification, including operating parameters and control settings, without prior approval of owner.
C. After manufacturer has completed system start-up and commissioning. Joint commissioning of integrated system segments shall be completed.

3.4 ELECTRICAL WIRING AND MATERIALS

A. Install, connect and wire the items included under this Section. This work includes providing required conduit, wire, fittings, and related wiring accessories. All wiring shall be installed in conduit.
B. Provide wiring between thermostats, aquastats and unit heater motors, all control and alarm wiring for all control and alarm devices for all Sections of Specifications.
C. Provide status function conduit and wiring for equipment covered under this Section.
D. Provide conduit and wiring between the B.M.S. panels and the temperature, humidity, or pressure sensing elements, including low voltage control wiring in conduit.
E. Provide conduit and control wiring for devices specified in this Section.
F. Provide conduit and signal wiring between motor starters in motor control centers and high and/or low temperature relay contacts and remote relays in B.M.S. panels located in the vicinity of motor control centers.
G. Provide conduit and wiring between the PC workstation, electrical panels, metering instrumentation, indicating devices, miscellaneous alarm points, remotely operated contractors, and B.M.S. panels, as shown on the drawings or as specified.
H. All wiring to be compliant to local building code and the NEC.
I. Provide electrical wall box and conduit sleeve for all wall mounted devices.

3.5 PERFORMANCE

A. Unless stated otherwise, control temperatures within plus or minus 2°F humidity within plus or minus 3% of the set point and static pressure within 10% of set point.

3.6 COMMISSIONING, TESTING AND ACCEPTANCE

A. Perform a three-phase commissioning procedure consisting of field I/O calibration and commissioning, system commissioning and integrated system program commissioning. Document all commissioning information on commissioning data sheets which shall be submitted prior to acceptance testing. Commissioning work which requires shutdown of system or deviation from normal function shall be performed when the operation of the system is not required. The commissioning must be coordinated with the owner and construction manager to ensure systems are available when needed. Notify the operating personal in writing of the testing schedule so that authorized personnel from the owner and construction manager are present throughout the commissioning procedure.

1. Prior to system program commissioning, verify that each control panel has been installed according to plans, specifications and approved shop drawings. Test, calibrate and bring on line each control sensor and device. Commissioning to include, but not be limited to:
    a. Sensor accuracy at 10, 50 and 90% of range.
    b. Sensor range.
    c. Verify analog limit and binary alarm reporting.
    d. Point value reporting.
    e. Binary alarm and switch settings.
    f. Actuator ranges.
    g. Fail safe operation on loss of control signal, electric power, network communications.

B. After control devices have been commissioned (i.e. calibrated, tested and signed off), each BMS program shall be put on line and commissioned. The contractor shall, in the presence of the owner and construction manager, demonstrate each programmed sequence of operation and compare the results in writing. In addition, each control loop shall be tested to verify proper response and stable control, within specified accuracy's. System program test results shall be recorded on commissioning data sheets and submitted for record. Any discrepancies between the specification and the actual performance will be immediately rectified and retested.

C. After all BMS programs have been commissioned, the contractor shall verify the overall system performance as specified. Tests shall include, but not be limited to:

1. Data communication, both normal and failure modes.
2. Fully loaded system response time.
3. Impact of component failures on system performance and system operation.
4. Time/Date changes.
5. End of month/ end of year operation.
6. Season changeover.
7. Global application programs and point sharing.
8. System backup and reloading.
9. System status displays.
10. Diagnostic functions.
11. Power failure routines.
12. Battery backup.
13. Smoke Control, stair pressurization, stair, vents, in concert with Fire Alarm System testing.
14. Testing of all electrical and HVAC systems with other division of work.

D. Submit for approval, a detailed acceptance test procedure designed to demonstrate compliance with contractual requirements. This Acceptance test procedure will take place after the commissioning procedure but before final acceptance, to verify that sensors and control devices maintain specified accuracy's and the system performance does not degrade over time.

E. Using the commissioning test data sheets, the contractor shall demonstrate each point. The contractor shall also demonstrate all system functions. The contractor shall demonstrate all points and system functions until all devices and functions meet specification.

F. The contractor shall supply all instruments for testing and turn over same to the owner after acceptance testing.
   1. All test instruments shall be submitted for approval.
   2. Test Instrument Accuracy:
   3. Temperature: 1/4F or 1/2% full scale, whichever is less.
   4. Pressure: High Pressure (psi): ½ psi or 1/2% full scale, whichever is less.
   5. Low Pressure (in w.c.): 1/2% of full scale
   6. Humidity: 2% RH
   7. Electrical: 1/4% full scale

G. After the above tests are complete and the system is demonstrated to be functioning as specified, a thirty day performance test period shall begin. If the system performs as specified throughout the test period, requiring only routine maintenance, the system shall be accepted. If the system fails during the test, and cannot be fully corrected within eight hours, the owner may request that performance tests be repeated.

3.7 TRAINING

A. The manufacturer shall provide factory trained instructor to give full instruction to designated personnel in the operation of the system installed. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach. The manufacturer shall provide all students with a student binder containing product specific training modules for the system installed. All training shall be held during normal working hours of 8:00 am to 4:30 PM weekdays.

B. Provide 16 hours of training for Owner's designated operating personnel. Training shall include:
   1. Explanation of drawings, operations and maintenance manuals
   2. Walk-through of the job to locate control components
   3. Operator workstation and peripherals
   4. DDC controller and ASC operation/function
   5. Operator control functions including graphic generation and field panel programming
   6. Operation of portable operator's terminal
   7. Explanation of adjustment, calibration and replacement procedures
   8. Student binder with training modules

C. Since the Owner may require personnel to have more comprehensive understanding of the hardware and software, additional training must be available from the Manufacturer. If such training is required by the Owner, it will be contracted at a later date.

END OF SECTION