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**PART 1        GENERAL**

**1.1            SUMMARY**

- .1        Section includes:
  - .1        Hardware and software requirements for an Operator Work Station (OWS) in a Building Energy Monitoring and Control System (EMCS).

**1.2            RELATED SECTIONS**

- .1        Section 25 05 01 – EMCS: General Requirements.
- .2        Section 25 05 02 – EMCS: Submittals and Review Process.
- .3        Section 25 05 03 – EMCS: Project Record Documents.
- .4        Section 25 30 01 – EMCS: Building Controllers.
- .5        Section 25 90 01 – EMCS: Site Requirements, Applications and Systems Sequences of Operation.

**1.3            DEFINITIONS**

- .1        Acronyms and definitions: refer to Section 25 05 01 - EMCS: General Requirements.
- .2        Remote Auxiliary OWS: performs identical user interface functions as primary OWS.

**1.4            OWS SYSTEM DESCRIPTION**

- .1        Consists of commercial personal computer (must be in current production) with sufficient memory and processor capacity to perform all functions specified.

**1.5            SUBMITTALS**

- .1        In accordance with Section 25 05 02 - EMCS: Submittals and Review Process.

**1.6            ENVIRONMENTAL CONDITIONS**

- .1        OWS to operate in conditions of 10 EC to 32 EC and 20 % to 90 % non-condensing RH.

**1.7            MAINTENANCE**

- .1        In accordance with Section 25 08 20 – EMCS: Warranty and Maintenance and Section 25 05 03 - EMCS: Project Records Documents.

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## **PART 2      PRODUCTS**

### **2.1            OWS HARDWARE**

- .1      PC system to include:
  - .1          Processor to be Core 2 Duo micro-processor, operating at clock speed of 2.2 GHz minimum, capable of supporting software necessary to perform functions specified in this section. System backplane bus (1066 Megahertz) to support PCI boards.
  - .2          Internal clock
    - .1              Uninterruptible clock having accuracy of plus or minus 5 seconds/month, capable of deriving year/month/day/ hour/minute/second.
    - .2              Rechargeable batteries to provide minimum 48 h clock operation in event of power failure.
  - .3          Asynchronous interfaces for connection to listed peripheral devices including LAN and remote devices.
- .2      Power supply unit to accept 120 V 60 Hz source and include line surge and low voltage protection for processor and its peripherals.
- .3      Include UPS to provide 30 minutes minimum operation of PC, CRT and communication and peripheral devices. This shall apply to fixed (non portable) OWS and peripherals.

### **2.2            OWS PC COMPONENTS**

- .1      Acceptable Product: Dell, HP, Compac, Acer Systems.
- .2      Components:
  - .1          Processor: Intel™ Core 2 Duo Processor E6700 (4MB L2 Cache, 2.66 GHz, 1066 FSB)
  - .2          Operating System: Genuine Windows Vista™ Business.
  - .3          Monitors: Dell, 22" Widescreen CRT.
  - .4          Memory: 2 GB Dual Channel DDR2 SDRAM at 533 MHz – 2 DIMMs.
  - .5          Hard Drives: 250 GB Serial ATA 3 Gb/s Hard Drive (7200 RPM) w/DataBurst Cache™.
  - .6          CD or DVD Drive: 8x DVD+/-RW Drive.
  - .7          Video Cards: 256 MB ATI Radeon X 1300 Pro.
  - .8          Sound Cards: Integrated Sound Blaster Audigy™ HD Software Edition.
  - .9          Network Card: Integrated Intel® PRO 10/100 Ethernet.
  - .10        Office Productivity Software (Pre-Installed): Microsoft® Works Suite 2006 – Includes MS WORD 2002, Encarta 2006 + more.
  - .11        Floppy Drive and Media Player: 3.5 inch Floppy Drive.
  - .12        Keyboard: Dell USB Keyboard.
  - .13        Mouse: Del Optical USB Mouse.

- .14 Modem: Integrated 56K Data/Fax modem.
- .15 Mouse: Microsoft Wireless Optical Mouse with Scroll-Ball. (see .14)
- .16 Hardware Support Services: 2 Year Next Business Day Onsite/In Home Service and Tech Support.
- .17 Power Protection: Belkin 7-Outlet Desktop Surge Protector.
- .18 Ports, Slots and Chassis:
  - .1 Externally Accessible:
    - .1 Video: VGA and 1 S-Video.
    - .2 IEEE 1394 – 1 front-panel 6-pin serial connector.
    - .3 USB: 8 Ports (2 Front, 6 Back) + 1 Internal.
    - .4 Audio: Audio – Six back-panel connectors for line-in, line-out, microphone, rear surround, side surround, SPDIF interface in rear, two front-panel connectors for headphones/microphone, integrated 7.1 channel sound.
    - .5 Additional Jacks: 1 front headphone jack and 1 front / 1 back microphone jack.
    - .6 Network: Integrated Ethernet.
    - .7 Integrated 10/100 network interface.
  - .2 Expansion Slots.
    - .1 Half-height PCIe x 1.
    - .2 Half-height PCIe x 16 (Graphics).
  - .3 Power Supply
    - .1 275 Watt DC Power Supply.
      - .1 Voltage: 200 to 240 V and 100 to 120 V at 50/60 Hz.
      - .2 Backup battery: 3-V CR2032 lithium coin cell.
  - .4 Chassis:
    - .1 3.5” Bays: 2 bays (one external; one internal)
    - .2 5.25 Bays: 1 Slimline bays.
    - .3 Memory DIMM slots: 4 available.
    - .4 Dimensions and Weight:
      - .1 H: 31.5 cm (12.5”)
      - .2 W: 9.4 cm (3.7”)
      - .3 D: 36.5 cm (14.5”)
      - .4 Weight: 7.7 kg (16.4 lbs)

## 2.3 PRINTERS

- .1 Print to file.

## **2.4 CONTROL DESK CONSOLE**

- .1 Capable of accommodating OWS and peripheral equipment specified with provision for operator desk work space.
- .2 Layout: to approval of Department Representative.
- .3 Desk: steel office type, standard sizes 1 m x 2 m, factory-made, computer type, for equipment mounting, with drawers on one side.
  - .1 Keyboards to be in separate pull-out drawer.
  - .2 Include above desk shelving to support contractor supplied manuals.
- .4 Chair: upholstered, swivel type, with adjustable arms back and seat, pneumatic seat height adjustment and 5 castors.

## **2.5 OPERATING SYSTEM (OS) OR EXECUTIVE**

- .1 To manage software operation of OWS.
  - .1 OS to support complement of hardware terminals and software programs specified.
- .2 OS to be true multitasking operating environment. MS DOS or PC DOS based software platforms not permitted.
- .3 OWS Software to operate in a "Windows" based operating environment. Software to be Windows Vista™, Business Edition.

## **2.6 OPERATOR'S CONTROL SOFTWARE**

- .1 OWS is not to form part of real-time control functions either directly or indirectly or as part of communication link. Real-time control functions to reside in MCUs, LCUs, and TCUs with peer to peer communication occurring at MCU to MCU device level.
- .2 Time Synchronization Module.
  - .1 System to provide Time Synchronization of real-time clocks in controllers.
  - .2 System to perform this feature on regular scheduled basis and on operator request.
- .3 User Display Interface Module.
  - .1 OWS software to support "Point Names" as defined in Section 25 05 01 - EMCS: General Requirements.
  - .2 Upon operator's request in either text, graphic or table mode, system to present condition of single point, system, area, or connected points on system to OWS. Display analog values digitally to 1 place of decimal with negative sign as required. Update displayed analog values and status when new values received.

Flag points in alarm by blinking, reverse video, different colour, bracketed or other means to differentiate from points not in alarm. For systems supporting COSV, refresh rate of screen data not to exceed 5 seconds from time of field change and system is to execute supervisory background scan every 20 seconds to verify point data value. For other systems, refresh rate not to exceed 5 seconds for points displayed. Initial display of new system graphic display (with up to 30 active points), including presentation of associated dynamic data not to exceed 8 seconds.

- .4 General Event Log Module: to record system activities occurring at OWS or elsewhere in the system including:
  - .1 Operator Log-in from any user interface device.
  - .2 Communication messages - errors, failures and recovery.
  - .3 Event notifications and Alarms by category.
  - .4 Record of Operator initiated commands.
- .5 The General Event Log:
  - .1 Able to be archived as necessary to prevent loss of information. Archiving to occur automatically.
  - .2 Hold minimum of 4 months' information and be readily accessible to operator.
- .6 Operator Control Software Module: To support entry of information into system from keyboard and mouse, disk, or from another network device. Display of information to user: dynamic displays, textual displays, and graphic displays to display logging and trending of system information and following tasks:
  - .1 Automatic logging of digital alarms and change of status messages.
  - .2 Automatic logging of analog alarms.
  - .3 System changes: alarm limits, set-points, alarm lockouts.
  - .4 Display specific point values, states as selected.
  - .5 Provide reports as requested and on scheduled basis when required.
  - .6 Display graphics as requested, and on alarm receptions (user's option).
  - .7 Display list of points within system.
  - .8 Display list of systems within building.
  - .9 Direct output of information to selected peripheral device.
  - .10 On-line changes:
    - .1 Alarm limits.
    - .2 Setpoints.
    - .3 Deadbands.
    - .4 Control and change of state changes.
    - .5 Time, day, month, year.
    - .6 Control loop configuration changes for controller-based CDLs.
    - .7 Control loop tuning changes.
    - .8 Schedule changes.

- .9 Changes, additions, or deletions, of points, graphics, for installed and future systems.
- .11 According to assigned user privileges (password definition) the following functions to be supported:
  - .1 Permit operator to terminate automatic (logic based) control and set value of field point to operator selected value. These values or settings to remain in effect until returned to automatic (logic based) control by the operator.
  - .2 Requests for status, analog, graphic displays, logs, controls to be through user interface screens.
- .12 Software and tools utilized to generate, modify and configure building controllers to be installed and operational on the OWS.
- .7 Message Handling Module - and Error Messages: Message Handling Module to provide message handling for the following conditions:
  - .1 Message and alarm buffering to be provided to prevent any loss of information.
  - .2 Error detection correction and retransmission to be included to guarantee data integrity.
  - .3 Informative messages to operator for data error occurrences, errors in keyboard entry, failure of equipment to respond to requests or commands, and failure of communications between EMCS devices.
- .8 Access Control to Field Equipment
  - .1 Minimum 5 levels of password access protection to limit control, display, or data base manipulation capabilities. The following is preferred format of progression of password levels:
    - .1 Guest: No password data access and display only.
    - .2 Operator Level: Full operational commands including automatic override.
    - .3 Technician: Data base modifications.
    - .4 Programmer: Data base generation.
    - .5 Highest Level : System Administration - Password assignment, addition, modification.
  - .2 User-definable, automatic log-off timers from 1 to 60 min. to prevent operators leaving devices on-line inadvertently. Default setting = 3 minutes.
- .9 Trend Data Module: Includes Historical data collection utility, Trend data utility, Control loop plot utility. Each utility to permit operator to add trend point, delete trend point, set scan rate.
  - .1 Historical data collection utility: collect concurrently operator selected real or calculated point values at operator selectable rate 30-480 minutes. Samples to include for each time interval (time-stamped), minimum present value, maximum present value, and average present value for point selected. Rate to be individually selectable for each point. Data collection to be continuous operation,

- stored in temporary storage until removed from historical data list by operator. Temporary storage to have at least 6 month capacity.
- .2 Trend data utility: continuously collect point object data variables for variables from building controllers as selected by operator, including at minimum; present value of the following point object types - DI, DO, AI, AO, AO set points value, calculated values. Trend data utility to have capacity to trend concurrently points at operator-selectable rate of 05 seconds to 3600 seconds, individually selectable for selected value, or use of COSV detection. Collected trend data to be stored on minimum 96 h basis in temporary storage until removed from trend data list by operator. Option to archive data before overwriting to be available.
  - .3 Control Loop Plot Utility: For AO Points provide for the concurrent plotting of the measured value input - present value, present value of the output, and AO setpoint. The operator selectable sampling interval to be selectable between 1 second to 20 seconds. Plotting utility to scroll to left as the plot reaches right side of display window. Systems not supporting control loop plot as separate function must provide predefined groups of values. Each group to include values for one control loop display.
  - .4 Trend data Module to include display of historical or trend data to OWS screen in X Y plot presentation. Plot utility to display minimum of 6 historical points or up to 6 trend points concurrently or 1 control loop plot. For display output of active trend data, display to automatically index to left when window becomes full. Provide plotting capabilities to display collected data based on range of selected value for (Y) component against time/date stamp of collected data for (X) component.
  - .5 Provide separate reports for each trend utility. Provide operator feature to specify report type, by point name and for output device. Reports to include time, day, month, year, report title, and operator's initials. Implement reports using report module. Ensure trend data is exportable to third party spreadsheet or database applications for PCs.
- .10 Report Module: reports for energy management programs, function totalization, analog/pulse totalization and event totalization features available at MCU level. Refer also to Section 25 30 01 - EMCS: Building Controllers.
- .1 Reports to include time, day, month, year, report title, operator's initials.
  - .2 Software to provide capability to:
    - .1 Generate and format reports for graphical and numerical display from real time and stored data.
    - .2 Print and store reports as selected by operator.
    - .3 Select and assign points used in such reports.
    - .4 Sort output by area, system, as minimum.
  - .3 Periodic/automatic report:
    - .1 Generate specified report(s) automatically including options of start time and date, interval between reports (hourly, daily, weekly, monthly), output device. Software to permit modifying periodic/automatic reporting profile at any time.

- .2 Reports to include:
  - .1 Power demand and duty cycle summary: see application program for same.
  - .2 Disabled "Locked-out" point summary: include point name, whether disabled by system or by operator.
  - .3 Run time summary: summary of accumulated running time of selected equipment. Include point name, run time to date, alarm limit setting. Run time to accumulate until reset individually by operator.
  - .4 Summary of run time alarms: include point name, run time to date, alarm limit.
  - .5 Summary of start/stop schedules: include start/stop times and days, point name.
  - .6 Motor status summary.



- .4 Report types:
  - .1 Dynamic reports: system to printout or display of point object data value requested by operator. System to indicate status at time of request, when displayed, updated at operator selected time interval. Provide option for operator selection of report type, by point name, and/or output device. Ensure reports are available for following point value combinations:
    - .1 Points inaccessible from this OWS (total connected for this location), multiple "areas".
    - .2 Area (points and systems in Area).
    - .3 Area, system (points in system).
    - .4 System (points by system type).
    - .5 System point (points by system and point object type).
    - .6 Area point (points by system and point object type).
    - .7 Point (points by point object type).
  - .5 Summary report: printout or display of point object data value selected by operator. Report header to indicate status at time of request. Ensure reports are available on same basis as dynamic reports. Provide option as to report type, point name, output device.
  - .6 Include preformatted reports as listed in Event/Alarm Module.
- .11 Graphics Display Module: Graphics software utility to permit user to create, modify, delete, file, and recall graphics required by Section 25 90 01 - EMCS: Site Requirements, Applications and Systems Sequences of Operation.
  - .1 Provide capacity for 100% expansion of system graphics. Graphic interface to provide user with multiple layered diagrams for site, building in plan view, floor furniture plan view and building systems, overlayed with dynamic data appropriately placed and permitting direct operator interaction. Graphic interface to permit operator to start and stop equipment, change set points, modify alarm limits, override system functions and points from graphic system displays by use of mouse or similar pointing device.
  - .2 Display specific system graphics: provide for manual and/or automatic activation (on occurrence of an alarm). To include capability to call up and cancel display of any graphic picture.
  - .3 Library of pre-engineered screens and symbols depicting standard air handling components (fans, coils, filters, dampers, VAV), complete mechanical system components (chillers, boilers, pumps), electrical symbols.
  - .4 Graphic development, creation, modification package to use mouse and drawing utility to permit user to:
    - .1 Modify portion of graphic picture/schematic background.
    - .2 Delete graphic picture.
    - .3 Call up and cancel display of graphic picture.
    - .4 Define symbols.
    - .5 Position and size symbols.

- .6 Define background screens.
- .7 Define connecting lines, curves.
- .8 Locate, orient, size descriptive text.
- .9 Define, display colours of all elements.
- .10 Establish co-relation between symbols or text and associated system points or other graphic displays.
- .5 User to be able to build graphic displays showing on-line point data from multiple MCU panels. Graphic displays to represent any logical grouping of system points or calculated data based upon building function, mechanical system, building layout, other logical grouping of points which aids operator in analysis of facility operation. Data to be refreshed on screen as "changed data" without redrawing of entire screen or row on screen.
- .6 Dynamic data (temperature, humidity, flow, status) to be shown in actual schematic locations, to be automatically updated to show current values without operator intervention.
- .7 Windowing environment to allow user to view several graphics simultaneously to permit analysis of building operation, system performance, display of graphic associated with alarm to be viewed without interrupting work in progress.
- .8 Utilize graphics package to generate system schematic diagrams as required in Section 25 90 01- EMCS: Site Requirements, Applications and Systems Sequences of Operation, and as directed by Owner's Representative. In addition provide graphics for schematic depicted on mechanical plan flow diagrams, point lists and system graphics. Provide graphic for floor depicting room sensors and control devices located in their actual location. For floor graphic include secondary diagram to show TCU-VAV box actuator and, flow sensor. Diagram to be single line schematic of ductwork as well as any associated heating coil or radiation valve. Owner's Representative to provide CAD. Provide display of TCU -VAV's in table form, include the following values as minimum; Space Temp, Setpoint, mode, actual flow, min flow setpoint, max flow setpoint, cooling signal value, and heating signal value. Table to be organized by rooms and floor groupings.
- .9 Provide complete directory of system graphics, including other pertinent information. Utilize mouse or pointing device to "point and click" to activate selected graphic.
- .10 Provide unique sequence of operation graphic or pop-up window for each graphic that is depicted on OWS. Provide access to sequence of operation graphic by link button on each system graphic. Provide translation of sequence of operation, a concise explanation of systems operation, from control descriptive logic into plain English language.
- .12 Event/Alarm Module : displays in window alarms as received and stored in General Event Log.
- .1 Classify alarms as "critical", "cautionary", "maintenance". Alarms and alarm classifications to be designated by personnel requiring password level.

- .2 Presentation of alarms to include features identified under applicable report definitions of report module paragraph.
- .3 Alarm reports:
  - .1 Summary of points in critical, cautionary or maintenance alarm. Include at least point name, alarm type, current value, limit exceeded.
  - .2 Analog alarm limit summary: include point name, alarm limits, deviation limits.
  - .3 Summary of alarm messages: include associated point name, alarm description.
- .4 Software to notify operator of each occurrence of alarm conditions. Each point to have its own secondary alarm message.
- .5 EMCS to notify operator of occurrence of alarms originating at any field device within the following time periods of detection:
  - .1 Critical - 5 seconds.
  - .2 Cautionary - 10 seconds.
  - .3 Maintenance - 10 seconds.
- .6 Display alarm messages in English.
- .7 Primary alarm message to include as minimum: point identifier, alarm classification, time of occurrence, type of alarm. Provide for initial message to be automatically presented to operator whenever associated alarm is reported. Assignment of secondary messages to point to be operator-editable function. Provide secondary messages giving further information (telephone lists, maintenance functions) on per point basis.
- .8 System reaction to alarms: provide alarm annunciation by dedicated window (activated to foreground on receipt of new alarm or event) of OWS with visual and audible hardware indication. Acknowledgement of alarm to change visual indicator from flashing to steady state and to silence audible device acknowledgement. Steady state to remain until alarm condition is corrected but must not impede reporting of new alarm conditions. Notification of any type of alarm not to impede notification of subsequent alarms or the function of Controller's/CDL. Random occurrence of alarms must not cause loss of any alarm or over-burden system. Acknowledgement of one alarm not to be considered as acknowledgement of any other alarms.
- .9 Controller network alarms: system supervision of controllers and communications lines to provide following alarms as minimum:
  - .1 Controller not responding - where possible delineate between controller and communication line failure.
  - .2 Controller responding - return to normal.
  - .3 Controller communications bad - high error rate.
  - .4 Controller communications normal - return to normal.
- .10 Digital/alarm status to be interrogated every 2 seconds as minimum or be direct interrupting non-polling type (COV). Annunciate each non-expected status with alarm message.

- .13     Archiving and Restoration Module.
  - .1       Primary OWS to include services to store back-up copies of controller databases. Perform complete backup of OWS software and data files at time of system installation and at time of final acceptance. Provide backup copies before and after Controller's revisions or major modifications.
  - .2       Provide continuous integrity supervision of controller data bases. When controller encounters database integrity problems with its data base, system to notify operator of need to download copy data base to restore proper operation.
  - .3       Ensure data base back-up and downloading occurs over LAN without specialized operator technical knowledge. Provide operator with ability to manually download entire controller data base, or parts thereof as required.
- .14     CDL Generator and Modifier Module.
  - .1       CDL Generator module to permit generation and modification of CDLs.
  - .2       Provide standard reference modules for text based systems module that will permit modification to suit site specific applications. Module to include cut, paste, search and compare utilities to permit easy CDL modification and verification.
  - .3       Provide full library of symbols used by manufacturer for system product installed accessible to operators for systems using graphical environment for creation of CDLs Module to include graphic tools required to generate and create new object code for downloading to building controllers.
  - .4       Module to permit testing of code before downloading to building controllers.

### **PART 3       EXECUTION**

#### **3.1       INSTALLATION REQUIREMENTS**

- .1       Provide necessary power as required from local 120 V emergency power branch circuit panels for OWS's and peripheral equipment.
  - .1       Install tamper locks on breakers of circuit panels.
  - .2       Refer to UPS requirements stated under OWS Hardware in PART 2.

**END OF SECTION**