

WebStat™ Temperature Control System

WITH WEB-BASED BUILDING MANAGEMENT

ENGINEERING GUIDE SPEC

1. GENERAL

1.1 SUMMARY

- A. Furnish all labor, materials, equipment, and service necessary for a complete and operating Temperature Control System (TCS) with Web-based Building Management, utilizing controls and components as shown on the drawings and as described herein. Drawings are diagrammatic only.
- B. All labor, material, equipment and software not specifically referred to herein or on the plans, that is required to meet the functional intent of this specification, shall be provided without additional cost to the Owner.

1.2 SYSTEM DESCRIPTION

- A. The entire Temperature Control System (TCS) shall be comprised of a network of commercial programmable thermostats communicating via LonTalk® communication protocol to a Web-based Controller. The Web-based Controller shall connect to the owner's local or wide area network, depending on configuration. Access to the system, either locally in the building, or remotely from a central site or sites, shall be accomplished through Microsoft Internet Explorer®, via the Internet and/or local area network.
- B. The Web-based Building Manager as provided in this Division shall be based on the Honeywell WebStat™ System incorporating the Niagara Framework™. Equivalent products must be approved in writing by the Consulting Engineer and be submitted for approval ten (10) days prior to the date of the bid submittal. Systems not developed on the Niagara Framework platform are unacceptable.

1.3 GENERAL

- A. The WebStat Controller (WSC) shall communicate over the LonWorks® network to perform building management control of the T7350 thermostats and Alarming, Trending, and Scheduling applications through a web browser. The WSC shall serve as network time master to synchronize the time and date in thermostats linked to it or with the internet time servers. The WSC shall provide System Administration functions such as: configuring network settings, site information settings, and device discovery for new thermostat installations.

1.4 SUBMITTAL

- A. Eight copies of shop drawings of the components and devices for the entire control system shall be submitted and shall consist of a complete list of equipment and materials, including manufacturers' catalog data sheets and installation instructions for all controllers, valves, dampers, sensors, routers, etc. Shop drawings shall also contain complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as a system. Terminal identification for all control wiring shall be shown on the shop drawings. A complete written Sequence of Operation shall also be included with the submittal package.
- B. Upon completion of the work, provide a complete set of 'as-built' drawings and application software on compact disk.

1.5 DIVISION OF WORK

- A. The TCS contractor shall be responsible for all thermostats, controllers, control devices, control panels, controller programming, thermostat input/output and controller network wiring.



- B. The TCS contractor shall be responsible for the WSC, programming of the WSC, development of all graphical screens, Web browser pages, setup of schedules, logs and alarms, LonWorks network management and connection of the WSC to the local or wide area network.

1.6 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 16, Electrical:
 1. Providing motor starters and disconnect switches (unless otherwise noted).
 2. Power wiring and conduit (unless otherwise noted).
 3. Provision, installation and wiring of smoke detectors (unless otherwise noted).
 4. Other equipment and wiring as specified in Division 16.

1.7 AGENCY AND CODE APPROVALS

- A. All products of the TCS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided with the submittal package. Systems or products not currently offering the following approvals are not acceptable.
 1. UL-916; Energy Management Systems.
 2. C-UL listed to Canadian Standards Association C22.2 No. 205-M1983 "Signal Equipment".
 3. CE.
 4. FCC, Part 15, Subpart J, Class A Computing Devices.

1.8 SOFTWARE LICENSE AGREEMENT

- A. The Owner shall be provided with any and all required IDs and passwords for access to any component or software program.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.10 JOB CONDITIONS

- A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features.

2. MATERIALS

2.1 ACCEPTABLE MANUFACTURERS

- A. Basis-of-Design: Honeywell.
- B. Products of other manufacturers will be considered for acceptance provided they equal or exceed the material requirements and functional qualities of the specified product. Requests for Architect/Engineer's approval must be accompanied by the "Substitution Request Form" and complete technical data for evaluation. All materials for evaluation must be received by the Project Manager and Specification Department at least 10 days prior to bid due date. Additional approved manufacturers will be issued by Addendum.

2.2 WEBSTAT CONTROLLER (WSC)

- A. The WSC shall provide the interface between the LAN or WAN and the Networked Programmable Thermostats and provide global supervisory control functions over the control devices connected to the WSC. It shall be capable of executing application control programs to provide:
 1. Calendar functions.
 2. Scheduling.
 3. Trending.
 4. Alarm monitoring and routing.
 5. Time synchronization.
- B. The WebStat Controller must provide the following hardware features as a minimum:
 1. Two Ethernet Ports - 10/100 Mbps.
 2. One RS-232 port.
 3. One LonWorks Interface Port - 78KB FTT-10A.
 4. On-Board Battery Backup.
 5. 128 MB RAM, 32 MB Flash memory for database backup.
 6. The WSC must be capable of operation over a temperature range of 32 to 122° F (0 to 50° C).
 7. The WSC must be capable of operation over a humidity range of 5 to 95% RH, non-condensing.

- C.** The WSC shall support Microsoft Internet Explorer Web browser access via the Intranet/Internet. It shall support a minimum of three simultaneous users.
- D.** The WSC shall support 12 Networked Programmable Thermostats (NPT).
- E.** Floor Plans:
 - 1. The WSC shall support 5 graphical illustrations of the building's layout coupled with the Networked Programmable Thermostats (NPT) depicting their location within the building.
 - 2. The WSC shall support multiple NPT in a single floor plan.
 - 3. The WSC shall provide user the ability to:
 - a. Create New Floor Plans.
 - b. Modify Existing Floor Plans.
 - c. Change the Images.
 - d. Change Thermostats.
 - e. View Different Floor Plans.
- F.** Schedules:
 - 1. The WSC shall provide 5 schedules that are weekly calendars for occupancy mode changes and holiday information.
 - 2. The WSC shall provide schedules for 3 occupancy modes:
 - a. Occupied - A period of time when the controlled environment is considered to be occupied.
 - b. Unoccupied - A period of time when the controlled environment is considered to be unoccupied.
 - c. Standby - A period during the normal occupied period when the space may not be occupied.
 - 3. The WSC shall provide user the ability to:
 - a. View Schedules.
 - b. Add/Modify Schedules.
 - c. Define Weekly Schedules.
 - d. Define Special Events.
 - e. Assign Thermostats.
 - f. Delete Schedules.
- G.** Alarm Notification:
 - 1. The WSC shall provide 25 configurable alarms, defining limits and priority, for the Networked Programmable Thermostats.
 - 2. The WSC shall provide alarm filtering based on occurrence, acknowledgment status, and priority.
 - 3. The WSC shall provide user the ability to:
 - a. View Alarms.
 - b. Add/Modify Alarms.
 - c. Delete Alarm Configuration.
 - d. Acknowledge Alarms.
 - e. Delete Alarms.
- 4. The WSC shall be configured to send e-mail alarm messages to a SMTP e-mail server within the LAN/WAN to which it is connected.
- H.** Trends:
 - 1. The WSC shall provide 5 configurable trends, depicting the values of selected points over a period of time ranging from a day to a year in a graphical format.
 - 2. The WSC shall provide trends plotting two points which are read by the same or two different thermostats.
 - 3. The WSC shall provide user the ability to:
 - a. View Trends.
 - b. Add/Modify Trends.
 - c. Delete Trends.
- I.** Users:
 - 1. The WSC shall provide for 3 types of users:
 - a. Contractor - Super user of the system and can perform all tasks.
 - b. Facility Manager - Building Engineer user of system and can perform tasks monitoring and maintaining HVAC equipment.
 - c. Tenant - User of system with limited access and only perform limited tasks.
 - 2. The WSC shall provide the ability to add or remove privileges from any of the user types above.

2.3 NETWORKED PROGRAMMABLE THERMOSTATS (NPT)

- A.** Networked Programmable Thermostats shall consist of a communicating commercial programmable thermostat conforming to LonMark® Space Comfort Profile and subbase to control commercial single zone HVAC equipment.
- B.** The NPT thermostat shall have a keypad for setting system parameters, a corresponding LCD display and a flip-down keypad cover. The thermostat shall be provided to match its intended application for control of Furnaces, air conditioning, heat pumps, modulating (direct or reverse action) heat and/or cooling etc. Five methods of dehumidification (minimum ON time, reheat, reset temp setpoint, hot gas bypass, and simple dehumidification), occupancy scheduling, time of day bypass, Adaptive Intelligent Recovery, and system mode selection shall be supported by the thermostat.
- C.** The NPT subbase shall include LonTalk Bus terminals and a jack for temporary connections to a personal computer. A service pin push button shall be provided to locate the device on the LonWorks network.

- D.** The NPT shall be capable of being configured by the WSC to share data with other network devices. Shared data shall include:
1. Day-of-week and time-of-day.
 2. System mode (Heat, Cool, Auto, Off, EM Heat).
 3. Current fan setting.
 4. Space temperature.
 5. Current setpoint.
 6. Space Relative Humidity.
 7. Occupied /Unoccupied schedule commands.
 8. Current occupancy status.
 9. Relay status (heat/cool stages and fan).
 10. Alarm status.
 11. Alarm log.
- E.** Configurable features shall include:
1. Day-of-week and time-of-day.
 2. System mode (Heat, Cool, Auto, Off, EM Heat).
 3. Proportional plus Integral plus Derivative (PID) temperature control.
 4. Current fan setting.
 5. Space temperature.
 6. Multiple remote space sensors.
 7. Current setpoint.
 8. Space Relative Humidity.
 9. Discharge air sensor.
 10. Schedule.
 11. Outdoor air sensor.
 12. Outdoor ambient lockout.
 13. Occupancy sensor.
 14. Occupancy bypass.
 15. Continuous unoccupied.
 16. Temporary setpoint changes.
 17. Temporary override.

2.4 NETWORKS

- A.** The Local Area Network (LAN) shall be a 100 Megabits/sec Ethernet network supporting Java®, XML, HTTP, and SOAP for maximum flexibility.
- B.** Local area network minimum physical and media access requirements:
1. Ethernet; IEEE standard 802.3
 2. Cable; 100 Base-T, UTP-8 wire, category 5
 3. Minimum throughput; 100 Mbps.

2.5 NETWORK ACCESS

- A.** Remote Access.
1. For Local Area Network installations, provide access to the LAN from a remote location, via the Internet. The Owner shall provide a connection to the Internet to enable this access via high speed cable modem, asynchronous

digital subscriber line (ADSL) modem, ISDN line, T1 Line or via the customer's Intranet to a corporate server providing access to an Internet Service Provider (ISP). Customer agrees to pay monthly access charges for connection and ISP.

2.6 WEB BROWSER GRAPHICAL USER INTERFACE

- A.** The system shall be capable of supporting a minimum of three simultaneous clients using Internet Explorer™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.
- B.** The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the WSC, shall not be acceptable.
- C.** The Web browser client shall support at a minimum, the following functions:
1. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
 2. HTML programming shall not be required to display system graphics or data on a Web page.
 3. Storage of the graphical screens shall be in the WebStat Controller (WSC), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
 4. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
 - a. Modify schedules, calendars, and set points in a graphical manner.
 1. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
 2. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
 - c. View trends.
 - d. View and acknowledge alarms.

2.7 OTHER CONTROL SYSTEM HARDWARE

- A. Space Temperature Wall Module. Wall Module shall be Honeywell or equivalent.
 1. Wall module shall have a 20K Ohm NTC thermistor temperature sensor with operating range of 45 to 99° F (7.2 to 37.2° C) under a locking cover/enclosure with UL 916 listing designed for mounting on a standard electrical switch box.
 2. Space temperature sensors shall be accurate to $\pm 1^{\circ}$ F ($\pm 0.5^{\circ}$ C).
- B. Duct Mount, Pipe Mount and Outside Air Temperature Sensors: Temperature sensors with an accuracy of $\pm 0.3^{\circ}$ F ($\pm 0.2^{\circ}$ C). Temperature sensors shall be Honeywell or equivalent.
 1. Outside air sensors shall include an integral sun shield.
 2. Duct sensors shall have sensor approximately in center of the duct, and shall have selectable lengths of 6, 12, and 18 in. (152, 305, and 457 mm).
 3. Multipoint averaging element sensors shall be provided where specified and shall have a minimum of one foot of sensor length for each square foot of duct area (provide multiple sensors if necessary).
 4. Pipe mount sensors shall have copper, or stainless steel separable wells.

3. EXECUTION

3.1 INSTALLATION

- A. Install system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.
- B. Drawings of the TCS are diagrammatic only and any apparatus not shown, but required to make the system operative to the complete satisfaction of the Architect shall be furnished and installed without additional cost.
 1. Low voltage electrical connections to control equipment shown specified or shown on the control diagrams shall be furnished and installed by this contractor in accordance with these specifications.
 2. Equipment furnished by the HVAC Contractor that is normally wired before installation shall be furnished completely wired. Control wiring normally performed in the field will be furnished and installed by this contractor.

3.2 WIRING

- A. All low voltage electrical control wiring to the control panels, WSC, computers and network components shall be the responsibility of this contractor.
- B. The electrical contractor (Div. 16) shall furnish all power wiring to control panels, electrical starters and motors.
- C. All wiring shall be in accordance with the Project Electrical Specifications (Div. 16), the National Electrical Code and any applicable local codes. All TCS wiring shall be installed in the conduit types specified in the Project Electrical Specifications (Div. 16) unless otherwise allowed by the National Electrical Code or applicable local codes. Where TCS plenum rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.

3.3 WARRANTY

- A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.
- B. Within this period, upon notice by the Owner, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by this contractor at no expense to the Owner.

3.4 WARRANTY ACCESS

- A. The Owner shall grant to this contractor, reasonable access to the TCS during the warranty period.

3.5 ACCEPTANCE TESTING

- A. Upon completion of the installation, this contractor shall load all system software and start-up the system. This contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to insure that the system is functioning in full accordance with these specifications.
- B. System Acceptance: Satisfactory completion is when this contractor has performed successfully all the required testing to show performance compliance with the requirements of the Contract Documents to the satisfaction of the Owner's Representative. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.6 OPERATOR INSTRUCTION, TRAINING

- A. This contractor shall provide 4 hours of instruction to the owner's designated personnel on the operation of the TCS and describe its intended use with respect to the programmed functions specified. Operator orientation of the systems shall include, but not be limited to; the overall operation program, equipment functions, commands, systems generation, advisories, and appropriate operator intervention required in responding to the System's operation.

4. SEQUENCES OF OPERATION

4.1 SUMMARY

- A. The heating and cooling setpoints shall be individually adjustable for both the occupied, unoccupied, and standby periods. The thermostat shall have a minimum deadband of 2° F (1° C) (no mechanical heating or cooling shall operate within this deadband). Space temperature deviation above the cooling setpoint or below the heating setpoint shall generate a demand signal to control the system as follows:
1. Heating: The thermostat shall control the heating output based on the demand signal communicated from the thermostat program, taking into account both space temperature deviation (proportional gain), the duration of that temperature deviation (integral), and the rate of change of the deviation (derivative gain). The thermostat shall energize heating equipment when space temperature falls below heating setpoint.
 2. Cooling: The thermostat shall control the cooling output based on the demand signal communicated from the thermostat program, taking into account both space temperature deviation (proportional gain), the duration of that temperature deviation (integral), and the rate of change of the deviation (derivative gain). The thermostat shall energize cooling equipment when space temperature exceeds cooling setpoint.
 - a. (Optional Remote Equipment) A solid state enthalpy changeover control shall determine the capability of the outdoor air to provide free cooling (optional). The system shall operate as follows:

1. Free Cooling available from Outdoor Air: On a call for cooling, the system shall enable the economizer to provide free cooling. If this does not meet the space demand, the system shall enable the call for mechanical cooling to satisfy the programmed setpoint.
2. Free Cooling not available from Outdoor Air: On a call for cooling, the system shall hold the economizer to minimum position and cooling shall be energized to satisfy the programmed setpoint.
3. Economizer Interface: The auxiliary relay contacts of the subbase shall be connected to the economizer's minimum position potentiometer or power circuit.
 - a. Occupied Period: The auxiliary relay contact will close, allowing the economizer to operate normally and be available for free cooling if outdoor conditions permit.
 - b. Unoccupied Period: The auxiliary relay contact will open, defeating the economizer minimum position.
4. Dehumidification: The thermostat shall provide five methods for dehumidification:
 - a. Minimum ON: Increasing the compressor minimum on time.
 - b. Reset: Lowering the cooling setpoint.
 - c. Reheat: Cooling and simultaneous reheat.
 - d. Auxiliary output: To external dehumidifier.
 - e. Hot gas bypass: Auxiliary output operates depending on humidity level and number of active cooling stages.
5. Heating Setback and Cooling Setup: Initiation of heating setback or cooling setup for each of 7 or 365 days shall be provided by a programmed time schedule down loaded into the thermostat from the WebStat Controller. When all or a portion of the programmed schedule is unavailable, the thermostat shall control to the factory default program.
6. Setpoint Recovery from Unoccupied to Occupied: The thermostat shall incorporate a ramping feature that gradually changes the space setpoints. During recovery operation, the setpoint changes at a rate in degrees per hour depending on the outdoor air temperature. If there is no outdoor air temperature sensor available, the minimum ramp rate is used. The WebStat Controller shall provide the ability to individually adjust ramp rates for heating and cooling.
7. Fan Operation: Fan operation shall be selectable as follows:
 - a. On: Fan operates continuously in occupied mode, and during standby modes, and during a call for heat or cool.
 - b. Auto: Fan is energized with calls for heating and cooling.
8. Minimum Stage Operation Time:
 - a. Minimum On: Heat - 1 minute; Cool - 3 minutes.
 - b. Minimum Off: Cool and Heat Pump - 1 minute.

9. Power Interruption:
 - a. On loss of power, the thermostat shall maintain programmed times and temperatures for 10 years.
 - b. On loss of power, clock and day information shall be maintained for a minimum of 48 hours.
10. Overrides:
 - a. The Temporary Occupied Override can be used when the thermostat is in Unoccupied or Standby modes. It shall switch to the Occupied mode for an installer-configured number of hours. The default shall be 3 hours.
 - b. The Temporary Unoccupied Override shall fix the schedule to operate in Unoccupied mode for a number of days (between 1 and 99) without changing programming saved in memory.
 - c. Pressing "Run Schedule" shall cancel override and return to the program.

END OF SECTION

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