Part 1 General

1.1 SECTION INCLUDES

.1 Thermostats.

.2 Humidistats.

.3 Dampers Motorized

.4 Damper operators.

.5 Time clocks.

.6 Miscellaneous accessories.

1.2 RELATED SECTIONS

.1 Section 23 05 48 - Vibration Isolation.

.2 Section 23 33 00 - Duct Work Accessories.

1.3 REFERENCES

.1 AMCA 500 - Test Methods for Louvres, Dampers and Shutters.

.2 ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.3 ASTM B32 - Solder Metal.

.4 ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.5 ASTM D1693 - Environmental Stress - Cracking of Ethylene Plastics.

.6 NEMA DC 3 - Residential Controls - Electric Wall-Mounted Room Thermostats.

.7 NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

1.4 SUBMITTALS FOR REVIEW

.1 Section 21 05 00: Procedures for submittals.

.2 Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

.3 Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

1.5 SUBMITTALS FOR INFORMATION

.1 Section 21 05 00: Submittals for information.

.2 Manufacturer's Instructions: Provide for all manufactured components.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

.1 Section 21 05 00: Submittals for project closeout.

.2 Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.

.3 Revise shop drawings to reflect actual installation and operating sequences.

.4 Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

.5 Warranty: Submit manufacturer’s warranty and ensure forms have been filled out in Citys name and registered with manufacturer.

1.7 QUALITY ASSURANCE

.1 The Installer shall have an established working relationship with the Control System Manufacturer, and be the authorized representative of the Manufacturer at bid time.

.2 The Installer shall have successfully completed Control System Manufacturer's classes on the control system. The Installer shall present for review the certification of completed training, including the hours of instruction and course outlines upon request.

.3 All products used in this installation shall be new, currently under manufacture, and shall be applied in standard off-the-shelf products. This installation shall not be used as a test site for any new products unless explicitly approved by the Engineer in writing. Spare parts shall be available for at least 5 years after completion of this contract.

1.8 REGULATORY REQUIREMENTS

.1 All work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of the local, provincial, and national authorities. Such codes, when more restrictive, shall take precedence over these plans and specifications. As a minimum, the installation shall comply with the current editions in effect 30 days prior to receipt of bids of the following codes:

.1 Canadian Electric Code (CEC)
.2 National Building Code (NBC)
.3 ASHRAE 135
.4 Underwriters Laboratories UL916

1.9 WARRANTY

.1 Section 21 05 00: Submittals for project closeout.

.2 Labor and materials for the control system specified shall be warranted free from defects for a period of 12 months after final completion and acceptance. Control system failures during the warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the City. The Contractor shall respond to the City's request for warranty service within 24 hours during normal business hours.

.3 All work shall have a single warranty date, even when the City has received beneficial use due to an early system start-up. If the work specified is split into multiple contracts or a multi-phase contract, then each contract or phase shall have a separate warranty start date and period

.4 Exception: The Contractor shall not be required to warrant reused devices, except for those that have been rebuilt and/or repaired. The Contractor shall warrant all installation labour and materials, however, and shall demonstrate that all reused devices are in operable condition at the time of Contract Administrator review.

1.10 MAINTENANCE SERVICE

.1 Section 21 05 00: Submittals for project closeout.

.2 Provide service and maintenance of control system from Date of Substantial Completion.

.3 Provide complete service of controls systems, including call backs. Make minimum of two complete normal inspections of approximately four (4) hours duration in addition to normal service calls to inspect, calibrate, and adjust controls, and submit written reports.

1.11 SYSTEM AND COMPONENT PERFORMANCE

.1 Reporting Accuracy. System shall report values with minimum end-to-end accuracy listed in Table 1.

.2 Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

Table 1
Reporting Accuracy

Measured Variable	Reported Accuracy
Space Temperature	±0.5ºC (±1ºF)
Relative Humidity	±5% RH

Table 2
Control Stability and Accuracy

Controlled Variable	Control Accuracy	Range of Medium
Space Temperature	±1.0ºC (±2.0ºF)	
Humidity	±5% RH	

Part 2 Products

2.1 CONTROLLERS (Stand-alone)

.1 Manufacturer: Honeywell Model T775 series 2000.

.1 Substitutions: Refer to Section 21 05 00.

.2 Graphical Interface Operating programming, includes a keypad lockout.

.3 Internal Time Clock Scheduler:

.4 Independent Modulating Outputs: 0-10 Vdc, 2-10 Vdc, 4-20 mA or Series 90

.5 Modulating High Or Low Limit Control

.6 Configurable Integral And Derivative Times (PID)

.7 Configurable Minimum Off Time

.8 Sensor Calibration

.9 Options

.1 NEMA 4X Enclosure
.2 Room Temperature Sensors
.3 Humidity sensors

2.2 CONTROL PANELS

.1 Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.

.2 NEMA 250, general purpose utility enclosures with enamelled finished face panel.

.3 Provide common keying for all panels.

2.1 DAMPERS - MOTORIZED

.1 Tamco Model 9000 EWT

.2 Other Acceptable Manufacturers:

.1 Alumavent
.2 Substitutions: Refer to Section 21 05 00.

.3 Performance: Test to AMCA 500.

.4 Frames: Extruded aluminum, welded or riveted with corner reinforcement, minimum 2.0 mm (0.081 inch) thick. Damper frame is 100mm (4 inch) deep.

.5 Blades: Extruded aluminum air foil profile, maximum blade size 150 mm (6 inches) wide, maximum blade length section 1200 mm (48 inches).

.6 Entire frame shall be thermally broken by means of polyurethane resin pockets complete with thermal cuts.

.7 Insulation : Internally insulated with expanded polyurethane foam and are thermally broken. Complete blade has an insulating factor of R-2.29 and a temperature index of 55.

.8 Blade Seals: Extruded silicone mechanically attached, field replaceable.

.9 Frame/Jamb Seals: Extruded silicone mechanically attached, field replaceable.

.10 Bearings: Celcon inner bearing fixed to a 7/16" (11.11 mm) aluminum hexagon blade pivot pin, rotating within a polycarbonate outer bearing inserted in the frame,

.11 Linkage: Installed in frame side and constructed of aluminum and corrosion-resistant, zinc-plated steel, complete with cup-point trunnion screws for a slip-proof grip.

.12 Leakage: Class 1A at 0.25 kPa (1 in. w.g.) static pressure differential. Class 1 at 1 kPa (4 in. w.g.) static pressure differential. Standard air leakage data is certified under the AMCA Certified Ratings Program.

.13 Maximum blade length Static Pressure: 1.0 kPa (4 inches wg)

.14 Temperature Limits: -40 to 100 degrees C (-40 to 212 degrees F).

2.2 DAMPER OPERATORS

.1 General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.

.2 Electric Operators:

.3 Acceptable manufacturers.

- .1 Belimo
- .2 Siemens
- .3 Honeywell
- .4 Schneider Electric
- .5 Johnson Controls

.4 Substitutions: Refer to Section 21 05 00.

.5 Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch minimum position potentiometer

.6 Number: Sufficient to achieve unrestricted movement throughout damper range.

2.3 HUMIDISTATS

.1 Humidistats: (Crawlspace)

.1 Manufacturer: Honeywell Model H46.

.1 Substitutions: Refer to Section 21 05 00.

.2 Line voltage, wall mounted

.3 Throttling range: Adjustable 4-6 percent relative humidity.

.4 Operating range: 20 to 80 percent.

.5 Maximum temperature: 43 degrees C(110 degrees F).

.6 Cover: Set point indication.

2.4 THERMOSTATS (Stand Alone)

.1 Line Voltage Thermostats: (Crawlspace)

.1 Manufacturer: Honeywell Model T651.

.1 Substitutions: Refer to Section 21 05 00.

.2 Dead band: Maximum 1 degree C(2 degrees F).

.3 Cover: Locking with set point adjustment, with thermometer

.4 Rating: Motor load.

2.5 TIME CLOCKS

.1 Seven day programming switch timer with synchronous timing motor and seven day dial, continuously charged Ni-cad battery driven power failure 8 hour carry over and multiple switch trippers to control systems for minimum of two and maximum of eight signals per day with two normally open and two normally closed output switches.

.2 Solid state programmable time control with multiple separate programs, 24 hour battery carry over duty cycling, individual on/off/auto switches for each program, 7 day programming, 365 day calendar with 20 programmable holidays choice of fail safe operation for each program, system fault alarm.

2.6 RELAYS.

.1 Control Relays. Control relays shall be plug-in type, ULC/CSA listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.

.2 Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.

2.7 CURRENT TRANSFORMERS.

.1 AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.

.2 Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full-scale output.

.3 Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.

2.8 VOLTAGE TRANSFORMERS.

.1 AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.

.2 Transformers shall be suitable for ambient temperatures of 4°C-55°C (40°F-130°F) and shall provide ±0.5% accuracy at 24 Vac and 5 VA load.

.3 Windings (except for terminals) shall be completely enclosed with metal or plastic.

2.9 CURRENT SWITCHES.

.1 Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that systems are ready to receive work.

.2 Beginning of installation means installer accepts existing conditions.

.3 Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

.4 Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

.5 Ensure installation components are complementary to installation of similar components.

.6 Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

.7 The Contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate — or if any discrepancies occur between the plans and the Contractor's work, and the plans and the work of others — the Contractor shall report these discrepancies to the Contract Administrator and shall obtain written instructions for any changes necessary to accommodate the Contractor's work with the work of others. Any changes in the work covered by this specification made necessary by the failure or neglect of the Contractor to report such discrepancies shall be made by — and at the expense of — this Contractor.

3.2 INSTALLATION

.1 Install to manufacturers written instructions.

.2 Check and verify location of thermostats humidistats and other exposed control sensors with plans and room details before installation.

.3 Provide isolation (two position) dampers of parallel blade construction.

.4 Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.

.5 Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

.6 Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.

.7 Provide conduit and electrical wiring to electrical requirements. Electrical material and installation to appropriate requirements of Division 16.

3.3 MANUFACTURER'S FIELD SERVICES

.1 Section 21 05 00: Prepare and start systems.

.2 Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

3.4 DEMONSTRATION AND INSTRUCTIONS

.1 Section 21 05 00: Demonstrating installed work.

.2 Demonstrate complete and operating system to City.

END OF SECTION