Corporate Finance Department
Materials Management Division

ADDENDUM NO. 4
BID OPPORTUNITY NO. 674-2005

CONSTRUCTION OF AN ALTERNATE EMERGENCY COMMUNICATION CENTRE – 700 ASSINIBOINE PARK DRIVE, WINNIPEG, MB

ISSUED: March 27, 2006
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URGENT

PLEASE FORWARD THIS DOCUMENT TO WHOEVER IS IN POSSESSION OF THE BID OPPORTUNITY

THIS ADDENDUM SHALL BE INCORPORATED INTO THE BID OPPORTUNITY AND SHALL FORM A PART OF THE CONTRACT DOCUMENTS

Template Version: A20040901

Please note the following and attached changes, corrections, additions, deletions, information and/or instructions in connection with the Bid Opportunity, and be governed accordingly. Failure to acknowledge receipt of this Addendum in Paragraph 10 of Form A: Bid may render your Bid Submission non-responsive.

PART E – SPECIFICATIONS

Division 15

Revise: Mechanical Specification Section 15051 Acceptable Materials and Equipment as follows:

Revise 1.2.7.1 to read: "Temperature Control Systems* - Johnson Controls"

Revise: Mechanical Specification Section 15400 Plumbing Fixtures and Equipment as follows:

Revise 2.8.2.6.1 to read:

Leonard model 220 STSTL ½" thermostatic point of use mixing valve with check stops. Provide 12"X10" (305X254) fully recessed stainless steel cabinet with lock and full height piano hinge, shock absorbers and mini-ball shut off valves as per detail MD-9.

Revise 2.8.2.9.1 to read:

Hytec/Kohler model AC-36 36"x36" (914x914) acrylic shower stall with dome, 2 soap ledges, 1 integral grab bar, slip-resistant floor, light fixture, c.p. brass drain, shower rod and curtain.

Revise 2.8.2.10.1 to read:

Hytec Model H6836LT acrylic shower enclosure, 68" x 35.5" x 84" (1700mm x 888mm x 2100mm), threshold design for barrier free wheelchair access, stainless steel wrap-around grab bar, 1" stainless steel shower curtain rod, brass drain with stainless steel strainer, right-hand fold-up seat, standard white. **Light fixture provided by fixture manufacturer, wiring by Division 16**. Division 15 to coordinate for light fixture opening.

Revise: Mechanical Specification Section 15800 as follows:

Replace 2.21 with the following:

"2.21 AIR-COOLED CONDENSING UNITS (12.5 TO 20 TONS)

.1 Carrier air-cooled condensing units as noted.

.1 SYSTEM DESCRIPTION

.1 Outdoor-mounted, air-cooled condensing unit suitable for on-the-ground or rooftop installation. Unit shall have 2 independent refrigeration circuits. Unit shall consist of dual scroll compressors, an air-cooled coil, propeller-type condenser fans, and a control box. Unit shall discharge supply air upward as shown on contract drawings. Unit shall be used in a refrigeration circuit matched with a packaged air-handling unit.

.2 QUALITY ASSURANCE

.1 Unit shall be rated in accordance with ARI Standard 360-2000, and shall be certified and listed in the latest ARI directory.

.2 Unit construction shall comply with ANSI/ASHRAE safety code, latest revision, and comply with NEC.

.3 Unit shall be constructed in accordance with UL 1995 standard and shall carry the UL and UL, Canada label.

.4 Unit cabinet shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).

.5 Air-cooled condenser coils shall be leak tested at 150 psig, and pressure tested at 480 psig.

.6 Unit shall be manufactured in a facility registered to ISO 9001:2000 manufacturing quality standard.

.3 DELIVERY, STORAGE, AND HANDLING

.1 Unit shall be shipped as single package only, and shall be stored and handled according to unit manufacturer's recommendations.

.4 EQUIPMENT

.1 General

.1 Factory-assembled, single piece, air-cooled condensing unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, compressor, holding charge (R-22), and special features required prior to field start-up.

.2 Unit Cabinet

.1 Unit cabinet shall be constructed of G-90 galvanized steel, bonderized and coated with a prepainted baked enamel finish.

.3 Fans:

.1 Condenser fans shall be direct driven, propeller-type, discharging air vertically upward.

.2 Fan blades shall be balanced.

.3 Condenser fan discharge openings shall be equipped with PVC-coated steel wire safety guards.

.4 Condenser fan and motor shaft shall be corrosion resistant.

.4 Compressor:

.1 Compressors shall be of the hermetic scroll type.

.2 Compressors shall be mounted on rubber grommets.

.3 Compressors shall include overload protection.

.4 Compressors shall be equipped with a crankcase heater.

.5 Compressors shall be equipped with internal high discharge temperature protection.

.5 Condenser Coil:

.1 Condenser coil shall be air-cooled and circuited for integral subcooler.

.2 Coil shall be constructed of aluminium fins (copper fins optional) mechanically bonded to internally grooved seamless copper tubes which are then cleaned, dehydrated, and sealed.

.6 Refrigeration Components:

.1 Refrigeration circuit components shall include high side pressure relief device, liquid line service valve, suction line service valve, a full charge of compressor oil, and a holding charge of refrigerant.

.7 Controls and Safeties:

.1 Minimum control functions shall include:
.1 Power and control wire terminal blocks.
.2 Compressor lockout on auto-reset safety until reset from thermostat.
.3 Recycle time delay of five minutes to prevent compressor short cycling.
.2 Minimum safety devices shall include:
.1 Automatic reset (after resetting first at thermostat):
.1 High discharge pressure cutout.
.2 Loss-of-charge cutout.
.3 Condenser fan motors to be protected against overload condition by internal overloads.
.2 Manual reset at the unit:
.1 Electrical overload protection through the use of define-purpose contactors and calibrated, ambient compensated, magnetic trip circuit breakers. Circuit breakers shall open all three phases in the event of an overload in any one of the phases or a single phase condition.

.8 Electrical Requirements:
.1 Nominal unit electrical characteristics shall be 575 v, 3-ph, 60 Hz. The unit shall be capable of satisfactory operation within voltage limits of 518 v to 660 v.
.2 Unit electrical power shall be single-point connection.
.3 Unit control circuit shall contain a 24-v transformer for unit control.

Replace 2.27 with the following:

2.27 CIT BACKUP ROOM COOLING SYSTEM (NOMINAL 5 TON PRECISION A/C UNIT) - AC-1, AC-2, AC-3

.1 GENERAL

.1 Summary

.1 These specifications describe requirements for a cooling system. The system shall be designed to maintain temperature within the room. The manufacturer shall design and furnish all equipment to be fully compatible with heat dissipation requirements of the site.

.2 Design Requirements

.1 The cooling system shall be a Liebert Challenger 3000 factory assembled unit model no. **BU067A-BAEI**. Standard 60 Hz units shall be UL listed and CSA (NRTL-C) certified. It shall be specifically designed for service from the front of the unit. The system shall be designed for draw-through air arrangement to insure even air distribution to the entire face area of the coil.

.2 Each system shall be capable of handling 2800 CFM (1321 L/s) at 0.30 inches of water (75 Pa) external static pressure with up discharge airflow with front return pattern. It shall have a total cooling capacity of 64700 BTU/HR (19 kW), sensible cooling capacity of 53,800 BTU/HR (15.8 kW), based on the entering air condition of 80°F (26.6°C) dry bulb, and 60 °F (15.5°C) wet bulb and 50% relative humidity. These units are to be supplied with 600 Volt, 3 phase, 60 Hz power supply. The main fan motor shall be 1.50 HP (1.11 kW).

.3 Submittals

.1 Submittals shall be provided with the proposal and shall include: Single-Line Diagrams; Dimensional, Electrical, and Capacity data; Piping and Electrical Connection Drawings.

.2 PRODUCT

.1 All Systems

.1 Cabinet and Frame Construction

.1 The frame shall be constructed of MIG welded tubular and formed steel. All frame components shall be finished in a black, powder-coat finish to protect against corrosion. The exterior panels shall be 18 gauge steel and shall be powder coated with white color paint. The panels shall be insulated with a minimum 1 in. (25.4mm), 1-1/2 lbs. (0.68 kg) density fiber insulation. Front and side panels shall have captive, 1/4 turn fasteners.

.2 The cabinet shall be designed so that all components are serviceable and removable from the front of the unit.

.2 Fan and Motor Section

.1 The fan shall be the centrifugal type, double width, double inlet. The shaft shall be heavy duty steel with self-aligning ball bearings with minimum life span of 100,000 hours.

.2 The fan motor shall be 1750 RPM and mounted on an adjustable base. The drive package shall be sized for 200% of the fan motor horsepower, and equipped with an adjustable motor pulley. The fan/motor assembly shall be mounted on vibration isolators. The fan shall be located to draw air over the coil to ensure even air distribution and maximum coil performance.

.3 Filter

.1 The filter shall be2 inches (51 mm) thick and rated not less than 20 % efficiency based on ASHRAE 52.1.

.4 Advanced Microprocessor Control

.1 The Advanced control processor shall be microprocessor based with a front monitor LCD display panel and control keys for user inputs. The controls shall be menu driven with on-screen prompts for easy user operation. The system shall allow user review and programming of temperature and humidity setpoints, alarm parameters, and setup selections including choice of control type. A password shall be required to make system changes. For all user selections, the range of acceptable input (temperature, humidity, or time delay) shall be displayed on the monitor screen. The system shall provide monitoring of room conditions, operational status in % of each function, component run times, date and time, and four analog inputs from sensors provided by others.

.2 Control

.1 The control system shall allow programming of the following room conditions:

.1 Temperature Setpoint 65 to 85°F (18-29°C)

.2 Temperature Sensitivity +1 to +9.9°F (0.6 to 5.6°C) in 0.1° increments

.3 Humidity Setpoint 20 to 80% RH

.4 Humidity Sensitivity +1 to +30% RH

.2 All setpoints shall be adjustable from the individual unit front monitor panel. The microprocessor can be set within these ranges, however, the unit may not be able to control to extreme combinations of temperature and humidity.

.3 Temperature Sensor shall be capable of being calibrated using the front monitor panel controls to coordinate with other temperature and humidity sensors in the room.

.3 Predictive Humidity Control

.1 The microprocessor shall calculate the moisture content in the room and prevent unnecessary humidification and

dehumidification cycles by responding to changes in dew point temperature.

.4 Compressor Short-Cycle Control
- .1 The control system shall include a program to prevent compressor short-cycling.

.5 System Auto-Restart
- .1 For start-up after power failure, the system shall provide automatic restart with a programmable (up to 9.9 minutes in 6-second increments) time delay. Programming can be performed either at the unit or from the central site monitoring system.

.6 Sequential Load Activation
- .1 During start-up, or after power failure, the microprocessor shall sequence operational load activation to minimize inrush current. Systems allowing multiple loads to start simultaneously are unacceptable.

.7 Front Monitor Display Panel
- .1 The microprocessor shall provide a front monitor LCD backlit display panel with 4 rows of 20 characters with adjustable contrast. This display (along with five front mounted control keys) shall be the only operator interface required to obtain all available system information such as room conditions, operational status, alarms, control and alarm setpoints, and all user selections including alarm delays, sensor calibration, DIP switch selections, and diagnostics. All indicators shall be in language form. No symbols or codes shall be acceptable.

.8 Alarms
- .1 The microprocessor shall activate an audible and visual alarm in event of any of the following conditions:
  - .1 High Temperature
  - .2 Low Temperature
  - .3 High Humidity
  - .4 Low Humidity
  - .5 Short Cycle
  - .6 Compressor Overload (Optional)
  - .7 Main Fan Overload (Optional)
  - .8 Humidifier Problem
  - .9 High Head Pressure
  - .10 Change Filter
  - .11 Loss of Air Flow
  - .12 Low Suction Pressure
  - .13 Loss of Power
  - .14 Custom Alarm (#1 to #4)
- .2 Custom alarms are four customer accessible alarm inputs to be indicated on the front panel. Custom alarms can be identified with prepared (programmed) alarm labels for the following frequently used inputs:
  - .1 Water Under Floor
  - .2 Smoke Detected
  - .3 Standby GC Pump On
  - .4 Loss of Water Flow
  - .5 Standby Unit On
- .3 User customized text can be entered for two of the four custom alarms. Each alarm (unit and custom) can be separately enabled or disabled, selected to activate the common alarm, and programmed for a time delay of 0 to 255 seconds.

.9 Audible Alarm
.1 The audible alarm shall annunciate any alarm that is enabled by the operator.
.10 Common Alarm
.1 A programmable common alarm shall be provided to interface user selected alarms with a remote alarm monitoring device such as a DDC system.
.11 Remote Monitoring
.1 All alarms shall be communicated to the Liebert monitoring system with the following information: date and time of occurrence, unit number, and present temperature.
.12 Analog Inputs
.1 The system shall include four customer accessible analog inputs for sensors provided by others. The analog inputs shall accept a 4 to 20 mA signal. The user shall be able to change the input to 0 to 5 VDC or 0 to 10 VDC if desired. The gains for each analog input shall be programmable from the front panel. The analog inputs shall be able to be monitored from the front panel.
.13 Diagnostics
.1 The control system and electronic circuitry shall be provided with self-diagnostics to aid in troubleshooting. The microcontroller board shall be diagnosed and reported as pass/not pass. Control inputs shall be indicated as on or off at the front monitor panel. Control outputs shall be able to be turned on or off from the front monitor panel without using jumpers or a service terminal. Each control output shall be indicated by an LED on a circuit board.
.14 Data Collection
.1 The control system shall maintain accumulative operating hours of compressor, reheat, humidifier, fan motor, and Econ-O-Coil. The ten most recent alarms shall also be retained.
.15 Communications
.1 The microprocessor shall be compatible with all Liebert remote monitoring and control devices.

.5 Infrared Humidifier
.1 The humidifier shall be of the infrared type consisting of high intensity quartz lamps mounted above and out of the water supply. The evaporator pan shall be stainless steel and arranged to be serviceable without disconnecting water supply lines, drain lines or electrical connections. The complete humidifier section shall be pre-piped ready for final connection. The infrared humidification system shall use bypass air to prevent over-humidification of the controlled space. The auto flush system shall automatically flush deposits from the humidifier pan. The system shall be field adjustable to change the cycle time to suit local water conditions. The humidifier shall have a capacity of 11 lbs/hr (5 kg/h).

.6 Electric Reheat
.1 The low-watt density, 304/304, stainless steel, finned-tubular electric reheat coils shall be capable of maintaining room dry bulb conditions when the system is calling for dehumidification. The reheat section shall include UL approved safety switches to

protect the system from overheating. The capacity of the reheat coils shall be 56,200 BTU/HR (16.5 kW), controlled in 2 stages.

.7 Plenum

.1 The unit shall be supplied with a 3 way air discharge plenum complete with air dischargegrills. The plenum shall be 18 in. (457mm) high. Insulated and powder painted the same color as the room unit.

.8 Disconnect Switch, Non-Locking Type

.1 The manual disconnect switch shall be mounted in the high voltage section of the electrical panel. The switch shall be accessible with the door closed.

.9 Remote Sensors

.1 The unit shall be supplied with remote temperature and humidity sensors. The sensors shall be connected to the unit by a 60 ft. (18m) shielded cable.

.10 Leak Detection

.1 The unit shall be provided with a single remote point leak detection sensor, Liqui-tect 300 Series.

.11 AC4 Autochangeover Panel

.1 The unit shall be a surface mounted panel with LCD display. Panel shall be indipendantly powered from 24 VAC source. The AC4 shall provide lead / lag control of up to 4 separate systems in one zone or 2 in 2 separtarate zones. Programining shall be done through the front display or from a serial port connection to a laptop computer. Progamalble features shall include time delays on switchover, alarm settings, and name designations. Autochangeover shall be performed by automatic schedules or by alarm inputs from each air conditioner.

.12 Digital Output Interface Card

.1 An optional card shall be installed in the air conditioner that will provide form C dry contacts for the following status and alarm conditions:
cooling status
heating status
humidifying status
dehumidifying status
high temperature alarm
high humidity alarm
low temperature alarm
low humidity alarm
high head pressure alarm
loss of airflow alarm
change filters alarm
water detected or customer alarm 1 alarm
customer alarm 2 alarm
unit off status
loss of communications (supervised)

.2 Section 15900 shall connect the above points to DDC to be accessible at the City of Winnipeg central monitoring station.

.13 Direct Expansion Self-Contained Systems

.1 Direct Expansion Coil

.1 The evaporator coil shall have 6.67 sq.ft. (0.62 sq. m) face area, 4 rows deep. It shall be configured as V frame and be constructed of copper tubes and aluminum fins and have a maximum face velocity of 405 ft. per minute (2.1 m/s) at 2800 CFM (1321 L/s). The coil shall be provided with a stainless steel drain pan.

.2 Refrigeration System

.1 The refrigeration system shall consist of a high efficiency scroll compressor, hot gas bypass, pressure safety switches, externally equalized expansion valve, filter drier, refrigerant sight glass and moisture indicator.
.2 A liquid line solenoid valve shall be provided for pump down control.
.3 A crankcase heater shall be provided for additional system protection from refrigerant migration during off cycles.

.14 Warranty and Service
.1 Manufacturer's warranty shall be for a period of one year from date of equipment start, but not more than 18 months from shipment. The warranty shall cover defects in material and workmanship and include labour to replace or repair the defective part.
.2 Manufacturer must have local representation and must have factory trained local serviceperson capable of servicing this type of equipment.

.3 CIT BACKUP ROOM AIR COOLED CONDENSER (FOR NOMINAL 5 TON PRECISION A/C UNIT) – CU-1, CU-2, CU-3

.1 Propeller Fan Condenser
.1 The Liebert manufactured air cooled condenser shall be the low profile, slow speed, direct-drive, propeller-fan type, model no. **DCSL083-B**. The condenser shall be constructed of aluminum and contain a copper tube, aluminum fin coil with an integral electric control panel. The system shall be designed for 95 °F (35 °C) ambient. The air cooled condenser shall have a 600 Volt, 3 phase, 60 Hz power supply. The main fan motor shall be 0.75 HP (0.55 kW).
.2 Propeller fan blades shall be constructed of aluminum with a maximum diameter of 30 inches and secured to the fan shaft by a heavy duty hub with set screw. Fan gurads shallbe heavy guage, close meshed, steel wire with corrisoin resistant finish. Fan shall be factory balanced and tested before shipment.
.3 Fan motor shall be provided with rain slingers, permanently lubricated bearings, and individual built-in overload protection. Motors shall be rigidly mounted on die-formed galvanzied steel supports.
.4 Condenser housing shall be constructed of bright aluminum sheet and divided into individual fan sections by full width baffles. Structural support members, includding coil support frame, motor, and drive support, shall be galvanized steel for strength and corrosion resitance. Aluminum legs are provdied with rigging holes for hoisting the unit into position.

.2 Lee-Temp Head Pressure Control
.1 The winter control system for the air cooled condenser shall be "Lee-Temp." The Lee-Temp system shall allow startup and positive head pressure control with ambient temperatures as low as -30°F (-34.4°C). The Lee-Temp package shall include: insulated receiver, pressure relief valve for each circuit, head pressure three-way control valve, and rotalock valve for isolating the refrigerant charge. The Lee-Temp receiver shall be factory insulated and mounted ready for the field connection to the air cooled condenser. The Lee-Temp heater shall be 150 Watt and require a separate power supply of 115 Volt, single phase, 60 Hz.

.3 Unit Disconnect Switch
.1 A locking disconnect factory installed and wired in enclosed condenser control section.

.6 Warranty and Service

.1 Manufacturer's warranty shall be for a period of one year from date of equipment start, but not more than 18 months from shipment. The warranty shall cover defects in material and workmanship and include labour to replace or repair the defective part.

.2 Manufacturer must have local representation and must have factory trained local serviceperson capable of servicing this type of equipment.

.4 EXECUTION

.1 Installation of Environmental Control Units

.1 General

.1 Install environmental control units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

.2 Electrical Wiring

.1 Install and connect electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's electrical connection diagram submittal to electrical contractor.

.3 Piping Connections

.1 Install and connect devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's piping connection diagram submittal to piping contractor.

.4 Supply and Drain Water Piping

.1 Connect drains to air conditioning unit. Provide pitch and trap as manufacturer's instructions and local codes require.

.2 Field Quality Control

.1 Start up environmental control units in accordance with manufacturer's start up instructions. Test controls and demonstrate compliance with requirements.

Revise: Mechanical Specification Section 15900 as follows:

Add: Part 1 – General Clauses as follows:

"1.1.3 General Scope And Related Work

.1 All Work required by these Controls Specifications, Schedules, Point Lists and Drawings shall be coordinated and provided by the single Contractor referenced in these Specifications as the Controls Subcontractor.

.2 If the Controls Subcontractor believes there are conflicts or missing information in the Contract documents then the Contractor shall promptly request clarification and instruction from the Contract Administrator before proceeding.

.3 The Controls Subcontractor shall have visited the project Site and obtained information as necessary to ensure that prevailing physical conditions and Project arrangements that may be material to the performance of the Work have been ascertained and accommodated in the bid. No claims for additional payments will be accepted due to the Contractor's failure to complete this survey.

.4 If, in order to complete the Work of the Controls Contract, private and/or public telephone lines and connections, including ISDN lines and/or LAN/WAN support and connections, are required then these shall be provided by the Contract Administrator to the Contractor, at the Contract Administrator's direct cost, in a timely manner.

.5 Provide interface to all of the points identified in the specification to the owners existing Johnson Controls Metasys EA Workstations, located at the Central Control Offices, 510 Main St., Winnipeg, Manitoba.

1.1.4 Controls Systems Description

.1 The Controls Subcontractor's Work shall consist of the provision of all labor, materials, special tools, equipment, enclosures, power supplies, software, software licenses, Project specific software configurations and database entries, interfaces, wiring, tubing, installation, labeling,

engineering, calibration, documentation, submittals, testing, verification, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, Warranty, specified services and items required by the Contract that are required for the functional turn-key operation of the complete and fully functional Controls Systems.

.2 Provide a complete, neat and workmanlike installation. Use only employees who are qualified, skilled, experienced, manufacturer trained and familiar with the specific equipment, software and configurations to be provided for this project.

.3 The Controls Subcontractor shall employ qualified and experienced Controls Systems, Software, Application Design, Installation and Project Supervision personnel to provide the specific solutions required to meet the Project requirements and who are available to undertake this work as scheduled.

.4 Manage and coordinate the Controls Systems work in a timely manner in consideration of the Project master schedules. Coordinate cooperatively with the associated work of the other trades so as to assist the progress and not impede or delay the work of associated trades.

.5 Controls Systems as provided shall incorporate, at minimum, the following integral features, functions and services:

.1 All automated monitoring, supervision, control, information storage and presentation as required by these Specifications.

.2 Operator information on all supervised building arrangements including but not limited to current status and value, historical archived information, summaries, analysis, displays, reports and operator control and management functions as required by the Specifications.

.3 The detection, annunciation and management of all alarm and non-expected conditions as required by the Specifications.

.4 The diagnostic monitoring and reporting of system functions, Nodes and communication networks.

.5 Interfaces between individual elements and the systems and networks provided by other trades as required by the Contract documents.

.6 All other Controls Systems functions as required by the Contract documents.

.6 The Controls System as provided shall comprise, at a minimum, the following primary elements:

.1 NAE Web Server

.2 Network and Application Nodes.

.3 Field Devices.

.4 Control wiring.

1.1.5 Quality Assurance

.1 General Requirements:

.1 The following companies are approved Controls Subcontractors

.1 Johnson Controls Branch Office

.2 All devices shall be CSA certified and UL or FM listed and labeled for the specific use, application and environment to which they are applied.

.3 All electronic equipment shall conform to the requirements of FCC regulations, part 15, section 15, governing radio frequency electromagnetic interference, and be so labeled.

.2 Workplace Safety And Materials Management

.1 Provide a safety program in compliance with the Contract Documents.

.2 The Controls Subcontractor shall have a comprehensive Safety Manual and a designated Safety Supervisor for the project.

.3 The Contractor and its employees and sub trades shall comply with Federal, Provincial and local safety regulations.

.4 The Contractor shall ensure that all subcontractors and employees have written safety programs in place that cover their scope of work.

.5 Hazards created by the Contractor or its subcontractors shall be eliminated before any further work proceeds.

.6 Hazards observed but not created by the Contractor or its subcontractors shall be reported to either the General Contractor or the Owner within the same day. The Contractor shall be required to avoid the hazard area until the hazard has been eliminated.

1.1.6 Submittals

.1 Shop Drawings, Product Data and Samples:
.1 The Controls Subcontractor shall submit shop drawings for review and acceptance by the Contract Administrator.
.2 Provide at minimum the following basic submittals:
.1 Individual System Schematics including sequences of operation.
.2 Complete Bill of Materials.
.3 Valve and Damper Schedules.
.4 Descriptions and/or product data sheets for all equipment, materials, software, firmware components and items to be furnished and provided. Information shall be Project specific and not general advertising.
.5 Samples of system graphic, zone control graphic and overall system Navigation Scheme.
.6 Details of telephone line, ISP and associated requirements to be provided by the Contract Administrator, at its cost, in order for the Contractor to complete the work.
.2 Operation and Maintenance Manuals
.1 At the completion of the project the Controls Subcontractor shall submit three sets of as-built documentation for the Owners Operation and Maintenance Manuals which shall include the following as a minimum:
.1 Name and address of installing contractor along with 24-hour emergency service telephone number.
.2 As-built version of Shop Drawings.
.3 Licenses, Guarantees and warranty documents for all equipment and systems.
.4 Include sections dedicated to software that includes a system overview and a detailed description of each software feature. The manual shall instruct the user on programming or re-programming any portion of the Controls Systems. Include complete documentation on all control programs, algorithms, setpoints, alarms, etc.

1.1.7 Warranty
.1 Standard Material and Labour Warranty:
.1 Provide a one-year labour and material Warranty on Controls Contract work provided under this Contract.
.2 If within twelve (12) months from the date of acceptance of the Controls Contract work and following receipt of written notice from the Contract Administrator the product is found to be defective in operation, workmanship or materials, then the product shall be promptly replaced, repaired or adjusted at the option of the Controls Subcontractor at the cost of the Controls Subcontractor.
.3 Maintain an adequate supply of materials available directly to the Project site such that replacement of key parts, including programming, may be promptly carried out. Warranty work shall be done during the Controls Subcontractor's normal business hours."

Replace 2.1 to 2.19, with the following:
"Part 2 - Products
2.1 Controls System Architecture
.1 General
.1 The Controls Systems shall consist of Operator Workstations, Web Servers, Network and Application Nodes and their associated equipment connected by an industry standard communication network.
.2 The Interfaces provided shall incorporate complete tool sets, operational information displays, multi-Window displays and other interactive aids to assist interpretation and ease of use.
.3 The Workstations, Servers and principal network computer equipment shall be standard products of recognized major manufacturers available through normal PC and computer vendor channels – not "Clones" assembled by a third-party subcontractor.
.4 Provide licenses for all software residing on and used by the Controls Systems and transfer these licenses to the City prior to completion.
.5 The networks shall, at minimum, comprise, as necessary, the following:

.1 Workstations – fixed and portable as required by the Specifications.
.2 Network computer processing, data storage and communication equipment including Servers and digital data processors.
.3 Routers, bridges, switches, hubs, modems, interfaces and the like communication equipment.
.4 Active processing Network and Application Nodes including programmable field panels and controllers together with their power supplies and associated equipment.
.5 Addressable elements, sensors, transducers and end devices.
.6 Third-party equipment interfaces as required by the Contract documents.
.7 Other components required for a complete and working Control Systems as specified.

.6 The system shall be modular in nature, and shall permit easy expansion through the addition of software applications, workstation hardware, network and application nodes sensors and actuators. The system architecture shall support 300% expansion capacity of all types of nodes and point types included in the initial installation.

.7 The Specifications for the individual elements and component subsystems shall be minimum requirements and shall be augmented as necessary by the Contractor to achieve both compliance with all applicable codes, standards, the requirements of the AHJ (Authority having jurisdiction) at the site and to meet all requirements of the Contract documents.

.2 Network

.1 The Controls Systems shall incorporate a primary Tier 1 network(s) utilizing standard Ethernet communications operating at a minimum speed of 10 Mb/sec. All Network Nodes, Web Servers, Configuration and Operator Workstations as a minimum shall reside on the primary Tier 1 network. At the Controls Contractor's option, they may also incorporate multiple and integrated secondary Tier 2 and tertiary Tier 3 networks

.2 At least one level of the communication Network shall be based upon the following open architecture(s); BACnet in accordance with ANSI/ASHRAE Standard 135-2001 or LonMark as per ANSI/EAI 709 (LonWorks).

.3 The networks shall utilize only copper and optical fiber communication media as appropriate and to comply with the applicable codes, ordinances and regulations and the AHJ. They may also utilize digital wireless technologies if required by the Project and approved by the Contract Administrator and the AHJ.

.4 The Owner shall provide all private and public telephones lines, ISDN lines and Internet Service Provider services and connections as necessary for the Controls Contractor to complete the work as contracted at the Owner's direct cost. The Controls Contractor shall identify the specific requirements in their shop drawing submittal.

2.2 Operator Workstations

.1 The Operator Workstations (OWS) shall provide the primary means of operator communication with the Controls Systems and shall be used for monitoring, operations, management, audit, reporting and other related functions. The OWS shall comprise PC and related facilities that have as their primary function the Operator Interface functionality. Refer to Part 3 herein for details of OWS quantities and locations.

.2 Each fixed OWS shall, at a minimum, consist of:

.1 Personal Computer c/w Windows 2000 / XP Professional
.2 Intel Pentium 4, 2.8 GHz, 512 MB SDRAM
.3 80 GB, 7200 RPM Hard Drive
.4 24X DVD/CD-RW Combo Drive
.5 Full ASCII keyboard and digital Mouse.
.6 Full color, 19 inch flat screen display CRT, minimum 1280 x 1024 resolution.
.7 Ink Jet Printer, 19 ppm monochrome, 14 ppm color

.3 The OWS shall be provided with all required and installed operating system, Application specific software and database support facilities, including the associated original manufacturer software licenses, as part of the base work and price of the controls contract. All software shall be to the original manufacturer's latest revision level at the time of delivery to project Site.

.4 Transfer all Controls Systems software licenses to the City, at no additional cost to the City, before the time of acceptance for the Work.

.5 The Controls Subcontractor will use the OWS and associated equipment as necessary for the purposes of setting up, calibrating and verifying the Work. This equipment and facilities shall be delivered to Site and installed by the Contractor as late as is feasible in the scheduling of the Work and shall comprise the latest versions of these products available at the time of delivery.

2.3 Operator Interfaces

.1 General

.1 The Controls Systems Operator Interfaces shall be user friendly, readily understood and shall make maximum use of colors, graphics (floor plans, individual system schematics), icons, embedded images, animation, text based information and data visualization techniques to enhance and simplify the use and understanding of the displays by authorized users at the OWS.

.2 User access shall be protected by a flexible and owner redefinable software-based password access protection. Password protection shall be multi-level and partition able to accommodate the varied access requirements of the different user groups to which individual users may be assigned. Provide the means to define unique access privileges for each individual authorized user. Provide the means to on-line manage password access control under the control of a project specific Master Password.

.3 The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:

.1 User access for selective information retrieval and control command execution.

.2 Monitoring and reporting.

.3 Alarm and non-normal condition annunciation.

.4 Selective operator override and other control actions.

.5 Information manipulation, formatting, display and reporting.

.6 Controls Systems internal performance supervision and diagnostics.

.7 On-line access to user HELP menus.

.8 On-line access to current as-built records and documentation. At minimum, one (1) copy of all record documentation shall be stored on a designated OWS or Server and be accessible to the City.

.9 Means for the controlled re-programming, re-configuration of systems operation and for the manipulation of database information in compliance with the prevailing codes, approvals and regulations for the component applications and elements.

.4 Provide an audit trail of all user activity on the Controls Systems including all actions and changes.

.5 Provide on-line reports and displays making maximized use of simple English language descriptions and readily understood acronyms, abbreviations, icons and the like to assist user understanding and interpretation. All text naming conventions shall be consistent in their use and application throughout the Controls Systems.

.2 Operator Interface

.1 The Operator Interface provided shall include the functionality to selectively combine data and information from any system element or component in the Controls Systems Application on a single window display panel at the Operator's option. This shall include both current information and historical data.

.2 Navigation Trees:

.1 Provide the capability to display multiple navigation trees that aid the operator in navigating throughout all systems and points connected. At minimum provide a tree that identifies all systems on the Controls Systems networks.

.2 Provide the capability for the Operator to add custom trees. The Operator shall be able to define any logical grouping of systems or points and arrange them on the tree in any selected order. Provide the capability to nest groups within other groups.

.3 Divisible Display Windows:

.1 Provide for the operator to divide the display area within a single window into multiple display panels. The content of each display panel can be any of the standard summaries and graphics provided in the Controls Systems Application.

.2 Provide each display panel with minimize, maximize and close icons.

.4 Alarms:

.1 Alarms shall be routed directly from primary Controls Systems Application Nodes to OWS and Server(s). Provide for specific alarms from specific points to be routed to selectable OWS and Server(s). The alarm management portion of the Controls Systems Operator Interface software shall, at minimum, provide the following functions:

.1 Log date and time of alarm occurrence.

.2 Generate a “Pop-Up” window on the display panel, with audible alarm, informing the Operator that an alarm has been received.

.3 Allow an Operator, with the appropriate password, to acknowledge, temporarily silence or cancel an alarm.

.4 Provide an audit trail for alarms by recording user acknowledgement, deletion or canceling of an alarm. The audit trail shall include the ID of the user, the alarm, the action taken on the alarm and a time/date stamp.

.5 Provide the ability to direct alarms to an e-mail address or alphanumeric pager. This must be provided in addition to the pop-up window described herein. Controls Systems that use e-mail and pagers as the exclusive means of annunciating alarms are not acceptable.

.6 Provide for any attribute of any object in the Controls Systems to be designated to report as an alarm.

.7 Provide the ability to add, delete or modify alarms.

.2 The Controls Systems Application shall annunciate systems diagnostic alarms indicating system failures and non-normal operating conditions.

.3 Provide the on-line means to display alarms by date/time of occurrence, priority class, point designation, value or other defined text keywords.

.5 Operator Transactions:

.1 Provide the means to automatically record all operator activities on the Controls Systems Application for the recall of same for reporting.

.2 Provide the means to sort and report activities by operator, date/time, activity type and system area.

.3 Provide access protection to preclude the unauthorized removal or tampering with records.

.6 Reports:

.1 Reports shall be generated and directed to the user interface display or printer. As a minimum, the Controls Systems Application shall provide the following reports:

.1 All points in the Controls Systems Application.

.2 All points in a user-defined group of points.

.3 All points currently in alarm.

.4 All points locked out.

.5 All Controls Systems Application schedules.

.6 All user defined and adjustable variables, schedules, interlocks, diagnostics, systems status reports and the like.

.2 Provide all applicable original manufacturers standard reports for the Controls Systems.

.7 Dynamic Color Graphics:

.1 Provide for any number of real-time color graphic displays shall be able to be generated and displayed in the Controls Systems Application limited only by memory data storage capacity.

.2 Values of real-time attributes displayed on the graphics shall be dynamic and updated on the displays.

.3 The graphic displays shall be able to display and provide animation based on real-time data that is acquired, derived or entered into the operating Controls Systems.

.4 Provide for the City to be able to change values (setpoints) and states in system controlled equipment directly from the graphic display.

.5 Provide a graphic editing tool that allows for the creation and editing of graphic files. It shall be possible to edit the graphics directly while they are on line, or at an off line location for later downloading to the Controls Systems.

.8 Schedules:

.1 Provide multiple schedule input forms for automatic time-of-day scheduling and override scheduling of operations. At a minimum, the following schedule types shall be accommodated:

.1 Weekly schedules.

.2 Temporary override schedules.

.3 Special “Only Active If Today Is A Holiday” schedules.

.4 Monthly schedules.

.2 Schedules shall be provided for each group, system and sub-system in the Controls Systems Application. It shall be possible to include all or any commandable points residing within the Controls Systems in any custom schedule. Each point shall have a unique schedule of operation relative to the system use schedule, allowing for sequential starting and control of equipment within the system. Scheduling and rescheduling of points shall be accomplished easily via the system schedule spreadsheets.

.3 Multiple monthly calendars for a 12-month period shall be provided that allow for simplified scheduling of holidays and special days in advance. Holidays and special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the weekly schedules.

.9 Trending And Data Collection:

.1 Trend and store point data for all actual and virtual (software) points and values as required by the Contract Administrator.

.2 At a minimum, provide the capability to:

.1 Add / Modify and Delete Trends

.2 Display trend data in textural and / or graphical format

.3 Display multiple points in a single trend study.

.10 Operator Access Security (Combined Password and User ID):

.1 Provide for Operator access into the Controls Systems via the use of on-line Owner defined software Password and User Identification (ID) pairs, unique for each Operator and unique throughout the Controls Systems Application, to supplement standard OWS password access control.

.2 Stored password/user ID definitions shall be stored in encrypted formats.

.3 Password logins shall not be echoed on any screen or printer except during Master Password definition processes. An operator defining a password shall be required to re-enter to confirm authenticity.

.4 Operator access privileges shall be definable in terms of functions and Project areas.

.5 As part of the access privileges definition for each user the Owner shall be able to define at minimum the following:

.1 Access times by day.

.2 Permanent or temporary, with expiry date, password.

.3 Number of incorrect access attempts allowed before the password is disabled.

.4 Whether or not the Operator is able to redefine their own password.

.5 A field for the Operator’s e-mail address.

.6 A field for the Operator’s contact phone number.

.7 Definition of the Operator’s access privilege functionalities including viewing only, full control, selected functions, etc.

2.4 Web Server

.1 General

.1 The Controls Systems shall support multiple remote Web based User Interfaces through a Web Server.

.2 The Web Server shall support an unlimited number (non simultaneous) of remote Web based User Interface(s) utilizing a mix of local Intranet, the Internet, telephone and cable modem connections.

.2 Web Server

.1 The Web Server shall be provided with all required and installed operating system, browser, management, end user, and application specific software and database support facilities, including the associated original manufacturer software licenses. All software shall be to the original manufacturer's latest revision level at the time of delivery to project Site.

.2 The Web Server hardware and software configuration shall be selected to support the number of installed Network and Application Nodes.

.3 The Web Server shall include either a software or hardware firewall.

.3 Web Based User Interface

.1 The Web Interface(s) shall be provided to operate through an IT industry standard Web Browser such as Internet Explorer or Netscape.

.2 The Web Interface(s) provided shall incorporate complete tool sets, operational information displays, multi-Window displays and other interactive aids to assist interpretation and ease of use.

.3 The Web Interface(s) provided shall not require the procurement or licensing of any special or proprietary software from the Controls Subcontractor or its suppliers. In the event that specialized proprietary software is required, the Controls Subcontractor shall provide to the Contract Administrator 10 licensed copies of the proprietary software.

.4 The Web Interface(s) shall support the following functions at a minimum:

.1 User Name and Password restricted access.

.2 Easy to use "tree" diagram access to the following functions

.1 Display of Graphical System representations with dynamic real-time data.

.2 Trend Data Display

.3 Addition and Deletion of Trend Studies

.4 Scheduling display and adjustment

.5 Alarm Summary Display and Alarm Management Functions.

.6 Adjustment and Override of Operating Parameters

2.7 Network and Application Nodes

.1 General

.1 The Controls Systems shall be composed of a mixture of Network and Application Nodes as required to meet the project requirements.

.2 The Nodes shall be designed, packaged, installed, programmed and commissioned in consideration of their specific service and prevailing operating conditions. They shall be proven standard product of their original manufacturer.

.3 A failure at a Node shall not cause failures or non-normal operation at any other system Node other than the possible loss of active real-time information from the failed Node.

.4 Ancillary equipment, including interfaces and power supplies, shall not be operated at more than 80% of their rated service capacity.

.5 Provide a UPS for each supervisory controller (NAE) and DDC controller. The UPS shall be sized to power each panel for a minimum of 30 minutes, in the event of primary power failure.

.2 Network Nodes

.1 The Controls Systems Tier 1 Network Nodes shall be designed and implemented entirely for use and operation on an Ethernet TCP/IP network such as the Internet or the Owner's Intranet. This functionality for operational access shall extend down to the field panel and field point level.

.2 The Tier 1 Network Nodes shall be fully IT compatible operating over industry standard IT infrastructure. The Controls Contractor shall coordinate with the IT infrastructure support staff or trade contractors to ensure compatibility and performance of the operation of the Controls Systems over the LAN/WAN made available for its shared use.

.3 The Tier 1 network shall be configured on IT industry standard off-the-shelf technologies

.4 Network Nodes may act as Application Nodes.

.3 Application Nodes:
- .1 Application Nodes (AN) shall provide both standalone and networked direct digital control of mechanical and electrical building systems as required by the Specifications.
- .2 Each AN shall retain program, control algorithms, and setpoint information for at least 72 hours in the event of a power failure and shall return to normal operation upon stable restoration of normal line power.
- .3 Each AN shall monitor its communication status and provide a system advisory upon communication failure and restoration.
- .4 The AN shall provide the functionality to download and upload configuration data
- .5 The AN shall perform the functional monitoring of all Controls Application variables, both from real hardware points, software variables, and controller parameters such as setpoints.
- .6 The AN shall be designed, packaged, installed, programmed and commissioned in consideration of their specific service and prevailing operating conditions. They shall be proven standard product of their original manufacturer and not a custom product for this project.
- .7 HVAC Systems
  - .1 Central HVAC Systems
    - .1 Standalone AN(s) shall be provided and programmed to control the Central Air Handlers, Heating and Cooling Plants as described in the sequence of operation
  - .2 Terminal HVAC Systems
    - .1 A dedicated AN shall be provided and configured for each Terminal HVAC Unit (CV and VAV Boxes, Dual Duct Boxes, Fan Coil Unit, Heat Pump, Unit Ventilator, packaged RTU, etc.)
    - .2 The Zone Temperature sensor associated with each AN controlling a CV, VAV or Dual Duct Box shall provide the ability (password protected access) to setup the box operating parameters (min/max flows, flow pickup Area, flow pickup K factor, etc.) or shall support the plug-in (at the sensor) of a portable service tool to do the same,
    - .3 Standalone AN(s) shall be provided and configured to control heating and cooling elements such as Wall Fin Radiation, Ceiling Radiant Heating and or Cooling, In-floor radiant Heating, Unit Heaters and Force Flows as called for in the sequences of operation.
  - .3 Mechanical Equipment with Microprocessor based Controls
    - .1 Controls Contractor shall integrate real-time data from building systems supplied by other trades and databases originating from other trades as called for in the sequences of operation.
    - .2 The Controls Systems shall include necessary hardware, equipment and software to allow data communications between the Controls Systems and building systems supplied by other trades.
    - .3 The trade contractors supplying other associated systems and equipment shall provide their necessary hardware and software at their cost and shall cooperate fully with the Controls Contractor in a timely manner and at their cost to ensure complete functional integration.

.4 Software:
- .1 The Application and/or Network Nodes shall support the following standard programming capabilities as required to achieve the specified sequences of operation.
  - .1 Execute custom, job-specific processes defined by the user to automatically perform calculations and special control routines using:
    - .1 System measured point data
    - .2 Calculated data
    - .3 The results from other processes
    - .4 User defined constants
    - .5 Arithmetic functions
    - .6 Boolean Logic Operators
    - .7 Proportional plus Integral plus Derivative Control Algorithms as required.

.2 The Application and/or Network Nodes shall support the following software features:

.1 Event Messaging: Provide for the automatic execution of user-defined messages on the occurrence of each predefined real-time event including equipment/point status change, approaching limit or alarm, time of day and the like.

.2 Optimum Start/Stop: Provide software to start equipment on a sliding schedule based upon indoor and outdoor conditions. Determine the minimum time of HVAC system operation needed to satisfy the space environmental requirements. The program shall also determine the earliest possible time to stop the mechanical systems. The optimum start/stop program shall operate in conjunction with, and be coordinated with, the scheduled start/stop and night setback programs.

.3 Auto Alarm Lockout: Provide for scheduled and automatic lockout of alarm annunciation from equipment during non-normal operating conditions including shutdown, emergency power operation, filter alarm and the like.

.4 Energy Metering: Provide software to monitor and totalize consumption as measured by the defined pulse meters.

.5 Event Initiated Programs and Custom Logic: Provide software to define custom logic sequences that reside in the Application and/or Network Nodes.

.6 Heavy Load Delays: Provide software to achieve protection against excessive demand situations during start-up periods by automatically introducing time delays between successive start commands to heavy electrical or other defined loads.

.7 Runtime Totalization: Automatically sample, calculate and store runtime hours for binary input and output points as listed in the point schedule of this specification.

.8 Analog/Pulse Totalization: Sample, calculate and store consumption totals on a daily, weekly or monthly basis for user-selected analog and 2binary pulse input-type points.

.9 Binary Totalization: Provide totalization for binary event counters.

2.8 Controls Systems Field Devices

.1 Input Devices:

.1 Temperature Sensors

.1 Outdoor Air Temperature Transmitter shall contain an RTD sensing element mounting in an enclosure rated for outdoor use. The output shall be compatible with the panel it serves. Transmitter shall be factory calibrated to an accuracy of + 1% over the full range.

.2 Pipe Temperature Transmitter shall contain an RTD sensing element to monitor water temperature. The Contractor shall provide brass wells of sufficient size for the pipe to be installed. The output shall be compatible with the panel it serves. Transmitter shall be factory calibrated to an accuracy of + 1% over the full range.

.4 Duct Type Temperature Transmitter shall be a general purpose RTD sensing element, moisture resistant transmitter for mounting into a duct. The operating range shall be as indicated with an accuracy of + 1% over the full range. The output shall be compatible with the panel it serves.

.5 Duct Averaging Type Temperature Transmitter shall be a general purpose RTD sensing element, moisture resistant transmitter for mounting into a duct. The operating range shall be as indicated with an accuracy of + 1% over the full range. The output shall be compatible with the panel it serves. The sensing element shall be of sufficient length to provide a minimum of one (1) foot of element for every two (2) square feet of coil area.

.6 Space Temperature Transmitter shall contain an RTD sensing element to monitor room air temperatures in the range of 30 degrees F to 90 degrees F, unless indicated otherwise. The transmitter shall be factory calibrated to an accuracy of + 1%. The output shall be compatible with the panel it serves. Transmitter shall be factory calibrated to an accuracy of + 1% over the full range.

.2 Humidity Sensors

.1 Humidity Transmitter Outside Air shall be capable of providing continuous measurement of percent relative humidity with an accuracy of + 2% over the

range 20 to 90% RH. The output shall be a proportional 4 to 20 milliamp or VDC signal. Transmitter shall have outside weather enclosure. Transmitter shall be General Eastern RH-1 or equal.

.2 Humidity Transmitter Duct shall be capable of providing continuous measurement of percent relative humidity with an accuracy of + 4% over the range of 10 to 80% RH. The output shall be a proportional 4 to 20 milliamp or VDC signal.

.3 Humidity Transmitter Space shall be capable of providing continuous measurement of percent relative humidity with an accuracy of + 3% over the range of 20 to 60% RH. The output shall be a proportional 4 to 20 milliamp or VDC signal.

.3 Pressure Sensors

.1 Pressure Transducers for steam service shall utilize a stainless steel sensor. The device shall output a 4-20 milliamp or VDC signal which is linear in relation to the sensed pressure. Accuracy shall be + 0.5% of the full scale. Power shall be from the controller and range from 22-26 volts DC. The unit shall have temperature compensation so that thermal effects are no more than + .05% of the full scale from 0-175 DEGF. The unit shall be suitable for the media and pressure measured.

.2 Differential Pressure Transducer shall be for air or water service. The device shall output a 4-20 milliamp or VDC signal which is linear in relation to the sensed pressure. Accuracy shall be + 0.5% of full scale. The power shall be from the controller and shall be in the range of 22-26 volts DC. The unit shall have temperature compensation so that thermal effects are no more than + .05% of the full scale from 32-100 DEGF. The transducer shall be suitable for the media and pressure measured.

4. Safeties and Alarms

.1 Low Limit Thermostats shall be of manual reset type, with setpoint adjustment. The sensing element shall be of sufficient length to provide a minimum of one (1) foot of element for every two (2) square feet of coil area. The element shall run fully across the coil on each pass. When any one foot of the element senses a temperature as low as the setpoint, the thermostat contacts shall open. These shall contain double pole switches for simultaneous remote alarms or as desired.

.2 Differential Pressure Switch for water shall have a single-pole, single-throw (SPST) contact, adjustable setpoint, UL rated 6 amperes at 120 volts, 100 psig design.

.3 Differential Pressure Switch for air shall have a single-pole, single-throw (SPST) contact, adjustable setpoint, UL rated 9.8 amperes at 120 volts

.4 Current Sensing Transducers shall be self-powered, solid state with adjustable trip current. Each transducer shall be selected to match the current and voltage of the application. The output shall be compatible with the panel it serves. Each transducer shall include an LED to indicate output status.

.5 Specialty Sensors

.1 Carbon Dioxide Transmitter shall be capable of providing continuous measurement of Carbon Dioxide levels with an accuracy of + 50 ppm over the normal operating range of 400 – 1000 ppm. Transmitter shall utilize microprocessor based temperature compensated infrared sensing technology.

.2 Output Devices:

.1 Control Dampers:

.1 Dampers required in the temperature and smoke control functions of the automatic control system shall be sized as shown on drawings or as specified.

.2 All damper frames shall be constructed of 13 gauge galvanized sheet metal or extruded aluminium of 12 gauge thickness, and shall have a flange or duct mounting. The blades shall be parallel or opposed, as required, and suitable for the air velocities to be encountered in the system. Replaceable Butyl rubber seals are to be provided on damper blades and installed along with the top and bottom of the frame. Stainless steel damper blades and seals shall be installed inside the frame sides. Seals and bearings shall be able to withstand temperatures ranging from minus 40 degrees F to plus 200 degrees F.

.3 Dampers shall be leak rated for 3 CFM/foot squared at 1" WG and 20 CFM/foot. squared at 4" WG or less in full closed position at 4" WG pressure differential across damper.
.4 Damper blades shall not exceed 6" in width. All blades are to be corrugated type construction, fabricated from two sheets of #22 gauge galvanized sheet steel, spot welded together. Blades are to be suitable for high velocity performance.
.5 Dampers shall be Ruskin CD-60 or equivalent.
.6 All smoke control dampers must conform to UL5555 and be Ruskin SD-60 or equivalent.

.2 Control Valves:
.1 Valves shall be sized by the control manufacturer to produce the required capacity at a pressure loss not exceeding the allowable pressure drop indicated on the drawing.
.2 Nominal body rating shall be not less than 125 PSI. However, the valve body and packing selected shall be sized to withstand the system static head plus the maximum pump head and the maximum temperature of the control medium, chilled water, steam, and/or hot water.
.3 Two-way modulating valves shall have close-off ratings exceeding the maximum pressure difference, at any load condition, between the outlet and inlet. Each valve shall be equipped with proper packing to assure there will be no leakage at the valve stem.
.4 Terminal unit two-way control valves shall have equal percentage characteristics. Terminal unit three-way control valves shall have linear flow characteristics.
.5 Valve sizes ½" through 2" shall have screwed connections. Valve sizes 2-1/2" and larger shall have flanged connections.

.3 Damper and Valve Operators:
.1 Damper and valve operator shall be electric and be provided for each automatic damper or valve and shall be of sufficient capacity to operate the damper or valve under all conditions and to guarantee tight close-off of valves, as specified, against system pressure encountered.
.2 Damper operators shall be direct drive and equal to those manufactured by Belimo. Provide sufficient quantity of damper operators to provide a minimum of 5 in-lbs of torque for every square foot of damper area.
.3 Each central system damper or valve operator shall be provided with spring-return for normally closed or normally open position for fail safe operation to account for fire, low temperatures, or power interruption as indicated or as appropriate.

.4 Electric to Pressure Transducers:
.1 Electric to pressure transducers shall be used to interface to pneumatically actuated field devices.
.2 Transducers shall produce a high volume pneumatic output.
.3 Transducers shall include both zero and span adjustment capabilities.

Add 2.23.7 to read:

Provide graphics for this system at the central monitoring station with ability to remotely change/adjust points/sequences.

Revise 2.24.1.4 to read:

Back-up heating: electric baseboard heaters c/w relays will be supplied and installed by Div 16, and fed from emergency power. This section shall integrate baseboard operation into overall room temperature control and be activated on a call for heating when normal building heating is inoperable due to power failure."

Revise 2.24.1.5 to read:

Back-up cooling: Wall-mount A/C units shall be integrated into room temperature control by this section, and shall be enabled when normal building cooling system is inoperable due to power failure. Provide all required interface hardware, wiring, connection to DDC, and DDC programming. Ensure that simultaneous operation of back up heating and cooling is prevented. Control wiring from A/C unit to its respective CU unit shall be by this section."

Revise 2.24.2.3 to read:

Back-up heating: Back-up heating: electric baseboard heaters c/w relays will be supplied and installed by Div 16, and fed from emergency power. This section shall integrate baseboard operation into overall room temperature control and be activated on a call for heating when normal building heating is inoperable due to power failure.

Revise 2.24.2.4 to read:

Back-up cooling: Wall-mount A/C units (2) shall be integrated into room temperature control by this section, and shall be operable under normal conditions and under power failure conditions. Emergency power supply to the units will be by Div.16. Only one A/C unit shall be enabled at any given time, the other unit shall be a stand-by unit, and shall be allowed to run when the lead unit fails. Provide alternating of the lead and stand-by units. Provide all required interface hardware, wiring, connection to DDC, and DDC programming. Ensure that simultaneous operation of back up heating and cooling is prevented. Control wiring from A/C unit to its respective CU unit shall be by this section.

Revise 2.24.5.3 to read:

Cooling/Back-up cooling: Wall-mount A/C units (3) shall be integrated into room temperature control by this section, and shall be operable under normal conditions and under power failure conditions. Emergency power supply to the units will be by Div.16. Only two A/C units shall be enabled at any given time as lead-lag, the other unit shall be a stand-by unit, and shall be allowed to run when one of the lead-lag unit fails. Provide alternating of the lead-lag and stand-by units. Provide all required interface hardware, wiring, connection to DDC, and DDC programming. Ensure that simultaneous operation of back up heating and cooling is prevented. Control wiring from A/C unit to its respective CU unit shall be by this section.

Revise 2.24.7.3 to read :

Cooling/Back-up cooling: stand-alone precision A/C units (3) shall be integrated into room temperature control by this section, and shall be operable under normal conditions and under power failure conditions. Emergency power supply to the units will be by Div.16. Only two A/C units shall be enabled at any given time as lead-lag, the other unit shall be a stand-by unit, and shall be allowed to run when one of the lead-lag unit fails. Provide alternating of the lead-lag and stand-by units. Provide all required interface hardware, wiring, connection to DDC, and DDC programming. Control wiring from A/C unit to its respective CU unit shall be by this section. Refer to section 15800 for A/C unit specifications and for list of points to be read by the DDC system from the manufacturer's common control panel supplied with the units."

Add 2.25.3 to read:

Unit heater thermostats provided by 15900, wired to unit heater by Div16.

Revise 2.26.2 to read:

" … the respective smoke exhaust fan shall energize and its FSD shall open".

Add 2.26.6 to read:

Provide graphics for this system at the central monitoring station with ability to remotely change/adjust points/sequences.

Add: 2.26.7 to read:

Refer to new attached mechanical detail MDR-4 for layout of smoke control compartments. Co-ordinate with Division 16.

Add 2.29.4 to read:

Room ventilation fan F-8 will be provided with emergency power supply by Div.16. This section shall provide controls for this room ventilation to achieve uninterrupted operation during power failure.

Add 2.38 Humidifier Control to read as follows:

.1 This Section shall provide all labour, parts, and accessories to achieve humidifier operation as per Clause 2.19 in Section 15600.

Add 2.39 SCR Heating Coil Control to read as follows:

.1 This Section shall provide all labour, parts, and accessories to achieve electric coil operation as per Clause 2.19 Electric Duct Heater.

Add 2.40 Elevation Room Ventilation Control to read as follows:

.1 This section shall provide a line voltage thermostat to activate the fan on temperature rise.
.2 Wiring of thermostat to fan by Div.16.

Add 2.41 Boiler Control to read as follows:

.1 This section shall provide all labour, programming, wiring, and accessories to achieve boiler operation as described in Section 15600, Clause 2.11.
.2 Provide graphics for this system at the central monitoring station with ability to remotely change/adjust points/sequences.

Add 2.42 Central Monitoring to read as follows:

.1 The DDC system shall pick up and forward to the City of Winnipeg central monitoring station the following points:
  .1 Miscellaneous electrical system monitoring points: refer to Electrical part of this addendum.
  .2 Liebert precision A/C units in C.I.T. Back-Up Room 132: for number of points refer to Section 15800 Clause 2.27 which is revised by this Addendum.
  .3 Miscellaneous environmental monitoring:
    .1 C.I.T. Back-Up Room 132: temperature out of range
    .2 UPS Room 104: temperature out of range
    .3 Server Room 109: temperature out of range
    .4 Wiring Closet 125: temperature out of range
    .5 Electrical Room 115: temperature out of range
    .6 Communications Room 110 and 122: temperature out of range

Add to Part 3 – Execution:

"3.10 Installation Practices:
  .1 Controls Systems Wiring
    .1 All conduit raceways, wiring, accessories and wiring connections required for the installation of the Controls Systems shall be provided by the Controls Contractor except as shown on the Electrical Trade documents. All wiring shall comply with the requirements of applicable portions of the Electrical Trade work and all local and national electric codes and the requirements of the AHJ.
    .2 All Controls Systems wiring materials and installation methods shall comply with the original equipment manufacturer recommendations and standards.
    .3 The sizing type and provision of cable, conduit, cable trays and raceways shall be the design responsibility of the Controls Subcontractor.

    .4 Class 2 Wiring
      .1 All Class 2 (30VAC or less) wiring shall be installed in conduit unless otherwise specified.

.2 Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5 ft. from the building structure. Wiring shall be installed parallel to the building structural lines.

.5 Class 2 signal wiring and 24VAC power may be run in the same conduit. Power wiring 120VAC and greater shall not share the same conduit with Class 2 signal wiring.

.2 Line Voltage Power Sources

.1 120-volt AC circuits for the Controls Systems shall be taken by the Controls Subontractor from electrical trade panelboards and circuit breakers as designated on the electrical drawings.

.2 Circuits used for the controls systems shall be dedicated to these controls systems and shall not be used for any other services.

.3 Controllers for powered terminal units may use 120-volt AC power from motor power circuits.

.3 Controls Systems Raceways

.1 All wiring shall be installed in conduit or raceway except as noted elsewhere in the Specification.

.2 Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.

.3 All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the supporting surface.

.4 UL/ULC Listed Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls and for final connection to equipment.

.4 Field Panel Installation And Location

.1 The Controls Systems panels, enclosures and cabinets shall be located as coordinated with the Architect at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.

.2 All field devices shall be installed per the manufacturer recommendation and in accessible locations as coordinated with the Contract Administrator.

.3 Panels to be located in damp areas or areas subject to condensation shall be mounted with wall standoffs.

.4 Conduit configurations entering or leaving panels and devices shall be such as to preclude condensation traps.

.5 Identification

.1 All control components and services shall be identified with appropriately sized lamecoid labels with a unique name/number referencing item back to the shop drawings and or maintenance manuals.

.2 All control wiring conduits shall be color-coded and identified so as to be distinguishable from standard electric conduiting.

.3 Clearly identify all controls LAN hubs and racks.

.4 All control wiring terminations shall be taqgged and referenced.

3.11 Verification:

.1 Fully test and verify all aspects of the controls systems contract work on a point/system/integrated operational basis for all points, features and functions specified.

.1 Test each digital output for proper results from the operator workstation.

.2 Test each analog output by sending commands from the operators workstation to stroke an actuator throughout its range.

.3 Test each digital input for proper verification at the operators workstation. Jumper digital alarm inputs as required.

.4 Calibrate all temperature, humidity and pressure sensors with a hand held digital meter with equal or better accuracy.

.5 All software programs shall be fully tested to eliminate any glitches and to ensure conformance with the specifications. A system shall be considered commissioned when all alarms and system values are appropriate for the control sequence defined. Submit history logs for approval.

.2 Provide all necessary specialist labour, materials and tools to demonstrate to the Contract Administrator that the controls systems have been verified and are operating in compliance with the controls systems contract.
.3 Promptly rectify all deficiencies and submit in writing to the Contract Administrator a signed report that this has been done.
.4 The Architect will retest the deficiencies in conjunction with the Controls Subcontractor at the Contract Administrators option.

3.12 Training:
.1 The Controls Subcontactor shall provide the following training services for up to [three (3)] Owner's representatives at common sessions:
.1 Provide two (2) full days of on-site training by a field technician who is fully knowledgeable of the specific installation details of the Project. This training shall, at a minimum, consist the following:
.1 Review of project documentation control system software layout and naming conventions
.2 Basic Controls System operation.
.3 System reporting and alarm management.
.4 Scheduling and point trending.
.5 Setup of Paging feature.
.2 Should the Web based user interface differ from the Operator Interface provide an additional two (2) full days of on-site training consisting of the following:
a. Basic User Interface operation.
b. System reporting and alarm management.
c. Scheduling and point trending.

3.13 Schedule of Workstations and Web Servers.
.1 Provide a new OWS in
.2 Provide a new CWS in
.3 The Controls Subcontractor shall utilize their own CWS to setup and verify the complete installation.
.4 Provide a new Web Server located as suitable for this installation. The City shall supply Personal Computers to be used for remote access to the Controls Systems through the Web Server.

3.14 System Graphics
.1 Provide Home Navigation graphics complete with links to each central system graphic and one or more floorplan graphics
.2 Provide individual Color Graphics for each central Air Handler, Heating and Cooling System
.3 Provide one or more floorplan graphics with indication of each measured space temperature.
.1 Include a link on the floorplan graphic from each space temperature indicator to its associated terminal unit control graphic."

Division 16

Revise: Electrical Specification Section 16426 Intercom System

Add 2.8.2 to read as follows:

Metering shown on Drawing E-14 for sub-panels (UPS panels and totalizing meters shall be "ION#7350".
.1 Where indicated connect the meter to totalize loading.
.2 Provide output alarms at programmable set points. Contacts to close upon reaching the programmable load. This alarm output is connected to the building management system."

Revise Electrical Specification Section 16761 Intercom System

Revise . 2.5.1 to read:

.1 The slave station shall be TOA# Q-N8050WP.

Revise: Motor List

.1 Change Fan F-8 to 1/2 HP, 208V, 15A, 2P, cct EH37, 38
2#12 EH-41 to be spare.

.2 Refer to CU-4, change to read 600V – 3 Ph. Feed from 6MD-EA, 40 A - 3P, 3#8.

PART F – DRAWINGS

Add: Drawings MDR-1, MDR-2, MDR-3 and MDR-4

Revise: Drawing M-5 as follows:

.1 On Crawlspace North – Demolition plan show steam and condensate piping for heating coil of the air handling unit (note #2) as "existing to be removed".

.2 Revise New Construction Note #6 to read: "Suspend unit heater from structure".

Revise: Drawing M-6 as follows:

.1 On Boiler Room Plan – New Construction, delete note #33 and corresponding central vacuum unit.

.2 On Boiler Room Plan – New Construction: Unit heater UH-4 and fan F-10 shall have a common temperature control. Refer to Section 15900, Clause 2.28, revised by this addendum.

.3 On Boiler Room Plan – New Construction: show new boiler control panel and a DDC panel on east wall just south of expansion tank ET-1 location. Each panel will be fed by a dedicated 120V circuit by Div.16. The DDC panel will fed from emergency power, and the boiler panel from regular power supply.

Revise: Drawing M-7 as follows:

.1 Add acoustical insulation to fan F-1 return air duct upstream of silencer S-2 for the length of 1200 mm.

.2 Refer to shaft close to corridor 102, and change FSD (note #26) to FD.

.3 In Electrical Room 115 delete hydronic wall fin unit WF-4 with thermostat, remove supply and return piping back to mains.

.4 In Wiring Closet 125 provide wall thermostat connected to ceiling radiant panel.

.5 Add new DDC panels at the following locations. These will be fed by 120V dedicated circuits from emergency power by Div.16.

- .1 Communications Centre 110: just south of AC-17.
- .2 Communications Centre 122: just south of AC-8.
- .3 Electrical Room 115: on south wall close to doorway.
- .4 Mechanical Room 126: on north wall close to doorway.
- .5 Janitor Room 118: on south wall close to doorway.
- .6 CIT backup 132: east wall close to doorway.
- .7 UPS Room 104: west wall close to doorway.

.6 Revise Electrical Room 115 ventilation as per attached new detail sheets MDR-1/2/3.

- .1 Change electrical room ventilation fan F-8 from a CSP-A1450 to a GREENHECK Model BSQ-130-5, 1527 RPM, 373 W (½ HP), 187.5 Pa (0.75 in.w.c) S.P.
- .2 Add a filter bank FB-2 to upstream position of fan F-8. Filter bank shall consist of 600x600x51 size filters. Filter shall be FARR Model 30/30 pleated type and rated at 708 L/S and maximum initial pressure drop of 75 Pa. Filter bank shall be c/w Cam-lock fasteners on one side of the filter section. Access doors shall also have gaskets that butt against the filter frames to eliminate bypassing of air around filters.

Revise: Drawing E-2 Basement Plan Lighting

.1 Delete HWT-3 in Mechanical Room.

.2 Refeed existing 600V CDP located on East wall of Mechanical Room. Feed from 6MD-EA,100-3P, 3#1 in EMT.

.3 Manual starter shown for UH-4 to be on South wall of Mechanical Room, west of then existing door.

.4 Existing pumps P-9 and P-10 shown in S.W. stairwell to be fed from Panel EB, 30A-2P, 2#10 in EMT cct EB-1, 2 and EB-3, 4.

.5 Refer to central vacuum in Mechanical Room. Provide a contactor and addressable fire alarm relay to shutdown the vacuum upon an alarm signal.

.6 Refeed the existing sump pump in the N.W. stairwell. Sump pump is a 15A plug type cct EH-82.

.7 Feed new mechanical DDC control panel, cct EB20, located on East wall of Mechanical Room (south of UH-4).
.8 Feed new boiler control panel, cct EB21. Locate next to DDC panel on East wall of Boiler Room.
.9 To conserve wall space mount 6 CDP-A perpendicular to the West wall. Provide mounting channels as required for support.
.10 Allow for 8 type HB fixtures in Mechanical Room, to be installed as directed on site. Reuse existing circuit and switching. Two fixtures to be connected to panel EB as emergency lights. cct EB5. Turn over existing lighting to Owner.
.11 Provide 3/4" c/w wiring from room on East side of Telephone Room to the FACP. Locate FACP printer in this room.

Revise: Drawing E-3 Main Floor Lighting

.1 Room 120 shower, delete the 1 fixture type 'WC' in the shower. Install, wire and connect fixture provided by shower manufacturer. Provide suitable lamp.
.2 Room 114 shower, delete the 1 fixture 'WC' in the shower. Install, wire and connect fixture provided by shower manufacturer. Provide suitable lamp.

Revise: Drawing E-4 Main Floor Power

.1 Refer to Note #6. Change to read: "BP-7, 75W".
.2 Room 110, ceiling mounted outlet ED-21 (North) should be located adjacent to AC-16. Delete ED-21 shown in S.E. corner of room.
.3 Existing Panel 'D' is located adjacent to Janitor's Room 118, allow conduit and wire to extend 10-15A, 1P existing circuits c/w 15A – 1P breakers to panel ND (cct 12 to 21).
.4 Add 1 fourplex outlet in N.E. corner of Room 103, 15A-1P cct EG61.
.5 Room 109, change BBH control to read 'TF'.
.6 Room 110, change all BBH's control to read 'TF'.
.7 Room 131, change all BBH's control to read 'TF'.

Revise: Drawing E-5 Main Floor Fire Alarm System

.1 Refer to Mechanical Addendum for outlined areas showing smoke control zones. Fire alarm system devices within each zone to have a common output signal to the building management system so as to start fans F-4, 5, 6 or 7 as required.
.2 Refer to Vestibule 100-6, provide a connection to a door pushbutton, locate left of the F.A. remote annunciator, connect to door controller 100-6-A.
.3 Provide power to DDC panel, Room 115 adjacent to door cct EH84.
.4 Provide power to DDC panel, Room 118, cct EH83.
.5 Provide power to DDC panel, Room 122, SE corner near door to Room 127. cct EC65.
.6 Provide power to DDC panel, Room 110, SW corner near Corridor 107. cct ED45.
.7 Provide power to DDC panel, Room 126, behind door, cct EC64.
.8 Provide power to DDC panel, Room 104, adjacent to door. cct EG64.
.9 Provide power to DDC panel, Room 132, NE corner cct EG65.
.10 Room 104, CCTV power supply, connect to cct EG67.
.11 Locate CCTV DVR and monitor and CCTV controls in Room 103 in NE corner of room.
.12 Card access system PC to be located in Room 103.

Revise: Drawing E-6 Main Floor Communications

.1 Room 110, ceiling mounted TV outlet (north) should be located adjacent to AC-16 (see E-4). Delete TV outlet shown in South corner of room.
.2 Room 105, TV outlet should be located on ceiling between the windows.

Revise: Drawing E-8 Second Floor Power

.1 Room 202, fridge cct is mounted U/C.

Revise: Drawing E-9 Second Floor Fire Alarm System

.1 New FACP, feed from panel 2/c #12MI. Provide EMT sleeve where MI is exposed. cct EG66.

Revise: Drawing E-11 Third Floor and Roof Plan Lighting, Fire Alarm and Systems

.1 CCTV cameras shown are wall mounted with angle brackets on surface of wall. Provide liquid-tight flex from corner, up wall to roof and terminate flex in a weatherproof box. Home run cabling from weatherproof box to head end equipment using shaft at South end of roof.

Revise: Drawing E-14 Single Line Distribution Schematic

.1 The Building Management System will monitor the following items. Provide auxiliary contacts for each of the following points.

.1 Diesel trouble (Note 14).
.2 ATS – trouble (Note 14).
.3 Main breaker 6MD-A, 3 contacts – open/closed/tripped.
.4 Main breaker 6MD-EA, 3 contacts – open/closed/tripped.
.5 Tie breaker 6MD-A to 6MD-EA – 2 contacts – open/closed.
.6 Main breaker 2 CDP-A, 3 contacts – open/closed/tripped.
.7 Main breaker 2 CDP-EA, 3 contacts – open/closed/tripped.
.8 Tie breaker 2 CDP-EA to 2 CDP-A, 2 contacts – open/closed.
.9 6 MD-EA has 4-250 Amp breakers, 2 feeding each UPS, 3 contacts for each breaker – open/closed/tripped.
.10 Main breaker CDP-UPS-A, 3 contacts – open/closed/tripped.
.11 Main breaker CDP-UPS-B, 3 contacts – open/closed/tripped.
.12 Tie breaker CDP-UPS-A to CDP-UPS-B, 2 contacts – open/closed.
.13 DMS meter for CDP-UPS-A and CDP-UPS-B – Open/Closed.

.2 Refer to secondary feeders shown for TR-A and ETR-A. Change to read as follows: "10-1/c #500 MCM RA90 plus gnd".

Add: Detail Sheets MDR-1, MDR-2, MDR-3, MDR-4