MECHANICAL & ELECTRICAL ADDENDUM #1
OAKRIDGE COMMUNITY RECREATIONAL CENTRE
AIR HANDLING UNIT REPLACEMENT
63 PHARMACY AVENUE, TORONTO, ONTARIO. M1L 4S9
JUNE 21, 2024

The following document is hereby made a part of the Contract Documents. The following revisions and/or additions shall be made to Drawings and/or specifications and the cost shall be included in Tender Price.

General:

1. See attached Silencer Specifications for the new Supply and Return Air Silencers. Note that the Supply Air Silencer has been revised to be an elbow silencer as per the attached Data Sheet.
2. Contractor shall include for Clean, Prepare, Prime and Paint the existing structural support frame on the Roof (all vertical and horizontal members) and re-finishing all structural support frame members:
    a. Remove all existing paint and corrosion to near-white metal as per SSPC-SP15 Standards.
    b. Cleaned steel shall be free of all visible oil, grease, dirt, dust, mill scale, corrosion, paint, oxides and other foreign matter, except staining.
    c. Apply one (1) full coat of inorganic zinc-rich primer between 3.5 and 5 mils dry film thickness.
    d. Apply one (1) intermediate code of epoxy between 3.0 and 6.0 mils dry film thickness.
    e. Apply one (1) finish coat of aliphatic urethane between 2.5 and 4.0 mils dry film thickness.
3. Note that a complete Structural Load Review was not able to be completed during the Design Stage due to the presence of drywall ceilings obstructing view of the Roof Framing Structure. A Structural Engineer will be retained as part of the Cash Allowance to re-assess the Structure upon completion of exploratory openings by the General Contractor. As a result, include in the base tender price for the following:
    a. Removal of 600 square feet of existing drywall ceilings in the Change Room Areas below the air handling unit being replaced. Include for the temporary removal of eighteen (18) light fixtures, four (4) exhaust grilles and four (4) heat detectors (tied to the fire alarm system) to facilitate removal of the ceiling.
    b. New installation of 600 square feet of new drywall ceilings (2 layers of Type ‘X’ drywall), re-instate of eighteen (18) light fixtures, four (4) exhaust grilles and four (4) heat detectors to their original position. Verify the fire alarm devices as per CAN/ULC-S537 upon reinstatement.

    Any identified reinforcement necessary shall be completed through the Project Cash Allowance.
4. See attached AHU Specification 23 74 00.

END OF MECHANICAL & ELECTRICAL ADDENDUM #1

Noise Control Submittals

Job Name: Oakridge CRC
Engineer: Suri & Associates Ltd.
Date Printed: 6/18/2024
Spec Section: 15 - HVAC

Contact: 571 Chrislea Rd., Unit 3
Woodbridge, ON L4L 8A2

price®

All-In-One
Detailed Submittal Schedule
Noise Control

#	Qty	Model	Tag	Width (mm)	Height (mm)	Length (mm)	In. Leg (mm)	Out. Leg (mm)	Direction	Flow (L/s)	Vel. (m/s)	PD (Pa)	63	125	250	500	1K	2K	4K	8K	Target Design Criteria
1	1	ERM11B/4D	SL-AHU-1S	1000	900	3000	2000	2000	Forward	5428	6.00	62	13	20	35	50	53	50	44	34	NC-30 Receiver
Const Notes: Galvanized, CL2 (18 GA), 22GA Perf Liner, Fiberglass, Inlet: 2" Slip, Outlet: 2" Slip																					
2	1	RM11B/4F	SL-AHU-1R	1600	900	3000			Reverse	4908	3.40	60	20	33	52	55	55	55	38	21	NC-30 Receiver
Const Notes: Galvanized, CL1 (22 GA), 22GA Perf Liner, Fiberglass, Inlet: 2" Slip, Outlet: 2" Slip																					

Submittal

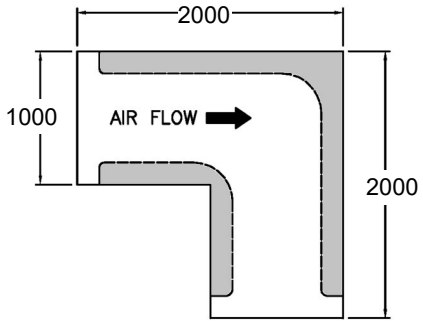
Email: noisecontrol@priceindustries.com
Web: pricenoisecontrol.com

ERM118/4D
Elbow Medium Velocity Silencer
Tag: SL-AHU-1S

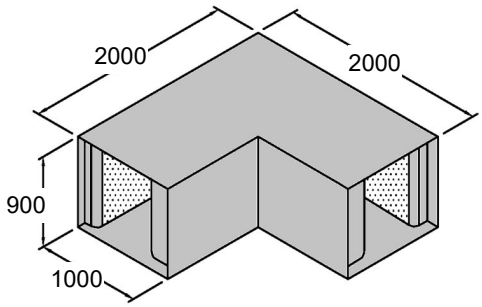
Dimensions

Quantity:	1	**Width (mm):**	1000	**Center Line (mm):**	3000
Weight (kg):	240	**Height (mm):**	900	**Inlet Leg (mm):**	2000
		Configuration:	Un-Nested	**Outlet Leg (mm):**	2000

END VIEW



TOP VIEW



ISO VIEW

Images are generic representations of and not to scale. The actual configuration may not be shown.

Performance

Air Volume (l/s):	5428
Air Velocity (m/s):	6.0
Air Direction:	Forward
Pressure Drop (Pa):	62

Dynamic Insertion Loss (dB)

63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
13	20	35	50	53	50	44	34

Generated Noise (dB)

63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
57	53	47	47	47	42	45	37

Construction

Casing:	18 GA Galvanized	**Acoustic Media:**	Glass Fiber	**Inlet Connection:**	2" Slip
Perforated Liner:	22 GA Galvanized			**Outlet Connection:**	2" Slip

Notes

- Price silencer material has flame spread classification < 25 and smoke development rating < 50 when tested in accordance with ASTM E84, UL723 and NFPA255.
- Installed silencer may have increased pressure drop resulting from system effect caused by duct elements located upstream or downstream of the silencer.
- Price silencers consist of ASTM A653(M) steel casings and liners.
- Price silencers are tested in our NVLAP-Accredited sound lab.
- Performance data is derived from test data in conformance with ASTM-E477-20.
- Ideal inlet and outlet conditions are assumed.
- Price silencers that are approved by the Price Noise Control team are guaranteed to perform as indicated.
- Customer to confirm all dimensions.

PROJECT: Oakridge CRC
CUSTOMER:
SUBMITTAL DATE: 6/18/2024
ENGINEER: Suri & Associates Ltd.
UNIT OF MEASURE: Hard Metric
PRICE QUOTE NO:
DESCRIPTION: Elbow Medium Velocity Silencer
DRAWING REVISION:
ERM//I/3000/4/D/M/1000/900/3000/1000/900/1/500/2.0/2000/2000/1000/1000/CL2/G/U/F//S2/S2/0////P22///

Submittal

Email: noisecontrol@priceindustries.com
Web: pricenoisecontrol.com

RM118/4F
Rectangular Medium Velocity Silencer
Tag: SL-AHU-1R

Dimensions

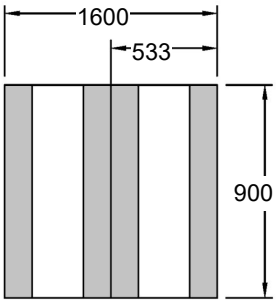
Quantity:	1
Weight (kg):	360

Bank

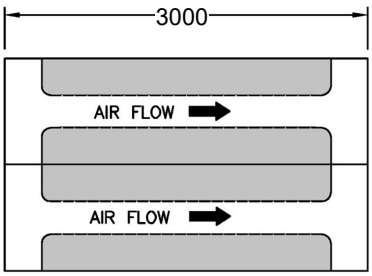
Width (mm):	1600
Height (mm):	900
Length (mm):	3000

Components

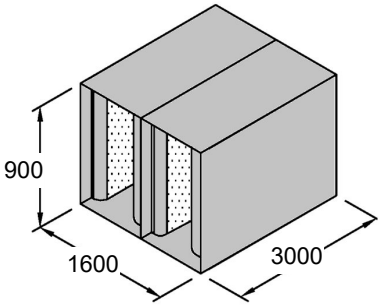
Quantity:	3
Width (mm):	533
Height (mm):	900



END VIEW



TOP VIEW



ISO VIEW

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Performance

Air Volume (l/s):	4908
Air Velocity (m/s):	3.4
Air Direction:	Reverse
Pressure Drop (Pa):	60

Dynamic Insertion Loss (dB)

63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
20	33	52	55	55	55	38	21

Generated Noise (dB)

63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
46	23	27	41	45	44	43	34

Construction

Casing:	22 GA Galvanized	**Acoustic Media:**	Glass Fiber	**Inlet Connection:**	2" Slip
Perforated Liner:	22 GA Galvanized			**Outlet Connection:**	2" Slip

Notes

- Price silencer material has flame spread classification < 25 and smoke development rating < 50 when tested in accordance with ASTM E84, UL723 and NFPA255.
- Installed silencer may have increased pressure drop resulting from system effect caused by duct elements located upstream or downstream of the silencer.
- Price silencers consist of ASTM A653(M) steel casings and liners.
- Price silencers are tested in our NVLAP-Accredited sound lab.
- Performance data is derived from test data in conformance with ASTM-E477-20.
- Ideal inlet and outlet conditions are assumed.
- Price silencers that are approved by the Price Noise Control team are guaranteed to perform as indicated.
- Silencer shipped in multiple components for assembly by Others.
- Customer to confirm all dimensions.

PROJECT: Oakridge CRC
ENGINEER: Suri & Associates Ltd.
DESCRIPTION: Rectangular Medium Velocity Silencer
RM//I/3000/4/F/M/1600/900/533/900/3/533/3.0/CL1/G/F//S2/S2/0////P22////0/0/0

CUSTOMER:
UNIT OF MEASURE: Hard Metric

SUBMITTAL DATE: 6/18/2024
PRICE QUOTE NO:
DRAWING REVISION:

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 200874-0

Price Sound Laboratory

Winnipeg, Manitoba
Canada

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Acoustical Testing Services

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2023-05-22 through 2024-06-30

Effective Dates

For the National Voluntary Laboratory Accreditation Program

1. GENERAL

1.1. Air Handling Units shall be built to the level of quality as herein specified and to the description of the Air Handling Unit Schedule.

1.2. No Substitution for the Air Handling Unit is permitted.

1.3. Unless stated otherwise, air-handling units are to be shipped to the job in one piece, factory assembled. Modular units assembled to achieve a close proximation to the intent of this specification will not be considered equal. All equipment shall where specified and applicable, be pre-wired, and factory certified by an approved testing agency such as $_{C}$ETL, ETL$_{US}$, UL, CSA prior to shipment.

1.4. Allow for craning on Weekend Hours for the removal of the existing unit (on one occasion) and a second craning on Weekend Hours for the installation of the new unit.

1.5. Pre-wired air handling units shall bear an approved label with all the necessary identification marks, electrical data.

1.4.1 Unit must conform to regulations set out in the Canadian Energy Efficiency Act for large air conditioners (condensing units). Packaged units shall be tested to CSA Standard C746-98 and must bear an EEV (energy efficiency verification) label provided by CSA.

"Where specified as factory packaged air conditioning unit, factory assembled split systems do not conform to the Canadian Energy Efficiency Act and will not be considered."

1.6. All electrical circuits shall undergo a dielectric strength test and shall be factory tested and checked as to proper function.

1.7. The air handling units and major components shall be products of manufacturers regularly engaged in the production of such equipment and with a minimum of twenty continuous years of proven production experience.

1.8. Air Handling Units shall be as manufactured by Engineered Air.

2. UNIT CONSTRUCTION

.1 Unit casing shall be of minimum 14-gauge outdoor-grade aluminum. All unprotected metal and welds shall be factory coated.

.2 All walls, roofs and floors shall be of formed construction, with at least two breaks at each joint. Joints shall be secured by sheet metal screws or pop rivets. Wall and floor joints shall be broken in and on all outdoor units roof joints broken out (exposed) for rigidity. All joints shall be caulked with a water resistant sealant.

.3 The following components shall be provided with a 22 gauge (.85mm) solid, or 24 gauge (.70mm) perforated (40% free area) galvanized metal liner over insulated areas:

	Solid Liner	Perf. Liner
- Fan Sections	___	_X__
- Coil Sections	_X__	___
- Filter Sections	_X__	___
- Access Sections	_X_	___
- Mixed Air Sections	_X_	___
- Underside of Unit(where visible)	_X__	___
- Discharge and return air Sections	___	_X_

.4 Units shall be provided with access doors to the following components: fans and motors, filters, dampers and operators, access plenums and humidifiers/wet cells, electrical control panels, burner compressor compartments. Access doors shall be large enough for easy access. Removal of screwed wall panels will not be acceptable.

.5 Units shall be provided with hinged access doors, with e-profile gasket, fully lined, and a minimum of two lever handles, operable from both sides for all units.

Hinged access doors open outwards on all sections for outdoors units. Doors located on sections with positive pressure shall have a clear warning label and a safety device must be affixed.

Whenever possible, hinged access doors to areas of negative pressure shall open out, and to areas of positive pressure shall open in. Where space constrictions require the use of outward opening doors to an area of positive pressure, a clear warning label and safety chain must be affixed.

Hinged access doors shall be provided with tie back clips.

.6 All units shall be internally insulated with 2"(51mm) thick 1.5 lb./cu.ft. (24 kg./cu.m.) density insulation.

.7 1.5 lb./cu.ft. (24 kg/cu.m.) insulation is secured with steel angles. All longitudinal insulation joints and butt ends shall be covered by a sheet metal break to prevent erosion of exposed edges. Drain pans and all floor areas shall be insulated on the underside.

.8 Unit casing floors shall be the same as unit walls and unit shall have reinforcing channels under floor to minimize deflection.

.9 Cooling coil drain pans shall be fabricated of stainless steel and are an integral part of the floor paneling, a minimum of 2" (51mm) deep, with welded corners. Drain pans shall extend a minimum of 6" (152mm) downstream of coil face and be provided with a 1 ½" (38mm) S.S. M.P.T. drain connection. Drain pans must have a fast pan and be sloped and pitched such that there is no standing water. Intermediate fast pans shall be provided between cooling coils where required for effective moisture removal.

.10 Air handling units shall be weatherproofed and equipped for installation outdoors. This shall include generally for the prevention of infiltration of rain and snow into the unit, louvers or hoods on air intakes and exhaust openings with 1"(25mm) galvanized inlet screens; rain gutters or diverters over all access doors; all joints caulked with a water resistant sealant; roof joints turned up 2" (51mm) with three break interlocking design; outer wall panels extend a minimum of ¼"(6mm) below the floor panel; drain trap(s) connections for field supply and installation of drain traps.

Units mounted on roof curbs incorporate welded floor to base construction. Floors are of three break upstanding design with welded corners and free of penetrations. Unit underside joints are caulked.

.11 Unit shall sit on the existing steel platform and be suitable for installation given the limited clearances available around the existing unit.

3. FANS

.1 Centrifugal fans shall be rated in accordance with AMCA Standard Test Code, Bulletin 210. Fan manufacturer shall be a member of AMCA. All fans and fan assemblies shall be dynamically balanced during factory test run. Fan shafts shall be selected for stable operation at least 20% below the first critical RPM. Fan shafts shall be provided with a rust inhibiting coating.

Centrifugal fans shall be rated in accordance with AMCA Standard Test Code, Bulletin 210. Fan manufacturer shall be a member of AMCA. All fans and fan assemblies shall be dynamically balanced during factory test run. Fan shafts shall be selected for stable operation at least 20% below the first critical RPM. Fan shafts shall be provided with a rust inhibiting coating.

.2 All fans assemblies shall be equipped with greaseable pillow block bearings, supported on a rigid structural steel frame.

.3 Drives shall be adjustable on fans with motors as schedules on the drawings or smaller. On fans with larger motors, fixed drives shall be provided. All drives shall be provided with a rust inhibiting coating. The air balancer shall provide for drive changes and changing of the belts, pulleys and sheaves (if required) during the air balance procedure.

.4 Provide full section return air fan(s) as scheduled. The use of power exhaust propeller or centrifugal fan arrangements will not be acceptable.

.5 Fan and motor sheaves shall be factory installed, fan balanced, and tested prior to shipment.

.6 Provide variable air volume fan control for units via Adjustable frequency drive shall be mounted in a NEMA 1 enclosure and shall be labeled by an approved testing agency such as UL. VFD shall be housed in a factory installed large cabinet with venting to allow proper ventilation.

Sine wave carrier input, PWM output. IGBT transistors. Adjustable acceleration and deceleration timing.

Keypad to be removable, with alphanumeric display able to provide output status monitoring, output frequency, output voltage, output RPM, and output current. Include fault log display with capacity for the recent 30 faults with a time stamp. Diagnostic display menus to include reference speed command, heat sink temp, bus voltage, active I/O command status, time from power up, and current setting.

Unit mounted manual VFD bypass switch locks out VFD, fan runs on maximum set volume. Bypass switch and all interlock contacts are factory mounted and pre-wired.

Line and load reactors required for all 460 and 575 volt applications.

Drive shall be factory supplied and installed in factory in an outdoor vented cabinet.

Minimum CFM of 40% on DX, gas fired heat exchangers, and electric heat systems.

Provide standard OSHA compliant belt guards on all units with walk in sections over 60" (1524 mm) high.

.7 Fan-motor assemblies shall be provided with vibration isolators. Isolators shall be bolted to steel channel welded to unit floor, which is welded to the structural frame of the unit. All fans Motor assemblies shall incorporate vertical spring type isolators with leveling bolts, bridge bearing waffled pads with minimum 1" (25mm) static deflection designed to achieve high isolation efficiency. Use of separate bumper or snubber is not acceptable. Fans shall be attached to the discharge panel by a polyvinyl chloride coated polyester woven fabric, with a sealed double locking fabric to metal connection.

.8 Provide single extended grease line from far side to access side bearing.

.9 Fan motors shall be TEFC Super-E high efficiency type with minimum of three year warranty.

4. COILS

.1 Coils shall be 5/8" O.D. and/or 1/2" O.D. as manufactured by Engineered Air, constructed of Copper tube, aluminum fin, and copper headers with schedule 40 steel pipe connectors.

.2 Fins constructed of aluminum or copper shall be rippled for maximum heat transfer and shall be mechanically bonded to the tubes by mechanical expansion of the tubes. The coils shall have a galvanized steel casing. All coils shall be factory tested with air at 300 psig (2070 kPa) while immersed in an illuminated water tank.

.3 Headers shall be outside the air tunnel and inside of enclosed section for maximum serviceability and all piping shall be fully concealed Provide auxiliary drain pan complete with ½" (13mm) MPT drain connection at headered end of cooling coils.

.4 Coils shall be removable from the unit at the header end, unless shown otherwise on the drawings.

.5 Refrigerant evaporator type coils shall be equipped with distributors connected to the coil by copper tubes. Where a hot gas bypass is required, the inlet shall be at the refrigerant distributor. Solenoid valves, expansion valves, and related accessories are to be provided and installed by the refrigeration contractor.

.6 Refrigerant coils with multiple compressors shall be alternate tube circuited in order to distribute the cooling effect over the entire coil face at reduced load conditions. Provision for use of thermal expansion valves must be included for variable air volume and/or make-up air applications.

5. GAS HEAT SECTION (DJE, DJS) - Indirect Fired

General

.1 Heating units shall be indirect natural gas fired approved for both sea level and high altitude areas. The entire package, including damper controls, fan controls, and all other miscellaneous controls and accessories shall be approved by an independent testing authority and carry the approval label of that authority as a complete operating package.

All units must exceed the ASHRAE 90.1 requirement of steady state efficiency at low fire operation.

.1 Operating natural gas pressure at unit(s) manifold shall be designed for a minimum of 5.5" W.C.(1750 Pa)

.2 Gas fired units shall be approved for operation in -20°F. Packaged controls to allow operation below -20°Fthat shutdown at -20°F(-40°C) by control package is not acceptable.

.2 Heat Exchanger/Burner Assembly

.1 Heat exchanger shall be a primary drum and multi-tube secondary assembly constructed of titanium stainless steel with multi-plane metal turbulators and shall be of a floating stress relieved design. Heat exchanger shall be provided with condensate drain connection. The heat exchanger casing shall have 1"(25mm) of insulation between the outer cabinet and inner heat reflective galvanized steel liner. Blower location shall be engineered to improve the required air flow pattern around the heat exchanger. Using duct type furnaces and closed coupled blowers are not acceptable.

.2 Units with optional high efficiency heat exchangers shall be tested and certified to ANSI/CSA standards to provide a minimum of 80%, efficiency throughout the entire operating range as required by ASHRAE 90.1. The manufacturer shall be routinely engaged in the manufacture of this type of high efficiency equipment.

.3 The heat exchanger/burner assembly shall be a blow through positive pressure type. Units incorporating the DJM module shall have an interrupted pilot ignition system to provide increased safety. Units using continuous or intermittent pilots are not acceptable.

.4 Flame surveillance shall be from the main flame after ignition not the pilot flame. The burner and gas train shall be in a cabinet enclosure. Atmospheric burners or burners requiring power assisted venting are not acceptable.

.5 The heat exchanger/burner assembly shall include 15:1 turndown for all input ranges. The high turn down heat exchanger/burner assembly minimum input shall be capable of controlling 6.7% of its rated input, excluding the pilot assembly, without on/off cycling and include built in electronic linearization of fuel and combustion air. Efficiency shall increase from high to low fire.

.3 Factory testing of indirect fired gas heating section.

.1 The minimum test requirements on all cabinet / fan size / fan type / fan orientation / heat exchanger / outlet configuration combinations previously built are listed below.

.1 Tests shall be performed after complete final unit assembly, just prior to shipping to job site. The tests shall be performed in accordance with the equipment standard that the gas heating section is certified.

.1 Heat exchanger shall be clocked with a dedicated calibrated gas meter to insure proper set up of the gas manifold.

.2 High and Low input flue gas combustion analysis using a calibrated combustion analyzer including O_2 and CO to provide proper air fuel ratio throughout the entire operating range.

.3 A copy of the combustion test report shall be provided.

.2 Any previously untested combination of cabinet / fan size / fan type / fan orientation / heat exchanger / outlet orientation and all duct furnaces shall have the following additional tests performed.

.1 Any single component or size or type or orientation change requires these tests. The tests shall be performed with standard factory temperature air, not design temperature air, through the unit as an additional heat exchanger safety factor.

.1 Heat Exchanger airflow pattern shall be tested to ensure uniform airflow across all parts of the heat exchanger.

.2 Once the equilibrium operating temperatures have been reached, the heat exchanger temperatures shall be checked to insure that all surfaces are below 1075°F (579.4°C). Temperatures above this can lead to premature heat exchanger failure.

.3 Flue gas temperature and combustion analysis shall be performed. The heat exchanger efficiency shall be analyzed and must meet current requirements.

.4 High limit operational check shall be performed to ensure proper function at all normal airflows including loaded filters.

.5 If the unit is capable of or intended to operate at varying air flows, all of the above tests must be performed at high flow and low flow.

.6 A copy of the test report shall be provided.

.3 Venting

.1 DJE and DJS venting is to be provided by the installing contractor using materials approved for outdoors. Installation and venting provisions must be in accordance with CAN/CSA Standard B149.1, ANSI Z223.1-NFPA54 and local authorities having jurisdiction. Where flue requirements exceed 6" (150 mm) above the unit casing height, it is the installing contractor's responsibility to provide and install venting including all structural-supporting requirements. Support is to be independent of the unit.

.2 Standard outdoor shall be provided with stainless steel Wedge style flue extension.

.4 Controls

.1 Electronic DJM module (Modulating Fuel w/ Modulating Combustion Air) complete with proportional and integral control with discharge air sensor to maintain set point temperature and provide rapid response to incremental changes in discharge air temperature. Combustion air motor speed varies proportionally in response to the modulation of gas flow to provide optimum fuel/air mixture and efficiency at all conditions. Combustion blower RPM shall be proved using a hall effect speed sensor. Two speed or step speed combustion blowers are not acceptable.

.2 Combustion efficiency of high efficiency heat exchangers shall increase by up to 1-3% from high fire to low fire while turning down on units incorporating 15:1 turndown (HT Burner). Heat exchangers shall provide a minimum of 80% efficiency throughout the entire operating range.

.3 Alternate manufacturers units that do not incorporate a variable speed combustion air blower shall have a modulating gas valve and a combustion air damper with a linear linkage connected to an actuator which has a minimum of 100 steps of control.

.4 Controllers for heating only units incorporating the J-XM module shall include the following standard features:

.1 Service analyzer with diagnostic lights for ease of set-up and service
.2 Linear gas and combustion air flow obtained via a built in solid-state linear algorithm
.3 -40°F(-40°C) minimum operating ambient temperature
.4 Four air change pre-purge on units with over 400MBH(117kW) input
.5 Maintained purge to decrease temperature cycles
.6 Post purge
.7 Interrupted pilot
.8 Self check on start-up to make sure air proving and discharge air sensors are operating within design tolerances
.9 Low fire start
.10 Controlled burner start-up and shut down
.11 Blower contactor that starts fan after burner prepurge
.12 Economizer enable control
.13 Damper contact that allows fan to start after damper opens, damper to close after fan stops, and damper to close on flame failure
.14 Non-recycling auto by-pass low limit with alarm contacts and built-in sensor checking
.15 Built-in alternate blower and damper functions and set back temperatures for unoccupied mode operation using a single room thermostat
.16 Separate gas and air actuators independently controlled to give the correct air to fuel ratio though out the entire firing range.

.5 Heating control function shall be modulating discharge air complete with sensor and integral selector.

.6 Controllers for heating only units to incorporate low limit feature.

.7 Discharge air sensor shall be field mounted in supply ductwork by installing contractor.

.8 The Manufacturer shall provide all controls and modules and provide all points as per controls diagram.

6. FILTERS

.1 Filter sections shall be provided with adequately sized access doors to allow easy removal of filters. Filter removal shall be from one side as noted on the drawings.

.2 For units with filter banks up to 72" (1825mm) high, the filter modules shall be designed to slide out of the unit. Side removal filters shall slide into a formed metal track, sealing against metal spacers at each end of the track.

.3 2"(50mm) Pleated Panel Disposable Filters: An optimum blend of natural and synthetic fiber media with a rust resistant support grid and high-wet strength beverage board enclosing frame with diagonal support members bonded to the air entering and air exiting side of each pleat. Provide permanent re-usable metal enclosing frame. The filter media shall have a minimum efficiency of 30-35% on ASHRAE Standard 52.1-92, and a minimum of MERV 13 per ASHRAE 52.2. Rated U.L. Class 2.

.4 Provide air filter pressure switch to BAS

.5 Where the filter gauges are provided on outdoor units they shall be mounted inside of a weatherproof enclosure with viewing window.

7. DAMPERS

.1 Damper frames shall be made Extruded aluminum airfoil type low leak airfoil Tamco Series 1000.

.2 Mixing dampers shall be parallel blade type.

.3 Gravity relief dampers shall be single blade gasketed design.

.4 Mixing Box Controls shall provide a modulating normally closed damper operator controlled via economizer controller integral to unit controls.

MECHANICAL COOLING

.1 Compressors shall be hermetic type, 3600 RPM, set on resilient neoprene mounts and complete with live voltage break internal overload protection and internal pressure relief valve. External crankcase heaters locked out during compressor operation.

.2 Air Cooled Condenser

.1 Condenser coils shall be copper tube type, mechanically expanded into aluminum fins. Coils shall be factory tested with air at 300 psig (2070 kPa) while immersed in an illuminated water tank.

.2 Condenser fans shall be direct driven propeller type arranged for vertical draw through airflow. Motors shall be weather resistant type, with integral overload protection and designed for vertical shaft condenser fan applications. Fan and motor assemblies shall be mounted on a formed orifice plate for optimum efficiency with minimum noise level.

.3 Condenser fan shall be fully housed fan with protective screen and fluted blades for optimum efficiency with minimum noise level.

.4 Condenser to form an integral part of the unit.

.3 Packaged Air Conditioning Units

.1 Packaged units shall be CETL, ETLUS approved and operate down to 50°F(10°C) as standard. Where applicable, multiple refrigeration circuits shall be separate from each other. Refrigeration circuits shall be complete with liquid line filter-driers, and service ports fitted with Schraeder fittings. Units with over 6 Ton hermetic compressors and all units with semi-hermetic compressors shall also incorporate load compensated thermal expansion valves with external equalizers and combination sight glass moisture indicators. units shall have condensers designed for 15°F (8°C) liquid sub-cooling and be equipped with suction line filters and liquid line manual shutoff valves. The complete piping system shall be purged and pressure tested with dry nitrogen, then tested again under vacuum. Each system shall be factory run and adjusted prior to shipment.

.2 Packaged units shall be supplied with R-410 refrigerant.

.3 Controls for hermetic compressor units shall include compressor and condenser fan motor contactors, supply fan contactors and overload protection, control circuit transformer, cooling relays, ambient compressor lockout, automatic reset low pressure controls, and manual reset high pressure controls on compressors over 6 tons. Head pressure actuated fan cycling control shall be provided on all multiple condenser fan units.

.4 Provide five minute anti-cycle timers.

.5 Provide inter-stage time delay timers.

.6 Provide hot gas bypass on the lead compressor to maintain adequate suction pressure in the event of low loads. This feature shall be provided on all VAV applications with less than four stages of cooling control.

.7 Compressors shall be located on the side of the unit in a service enclosure complete with hinged access doors c/w leverlok handles for ease of service and non-interrupting unit operation

.8 Modulating condenser reheat coil with stepper valve infinite modulating control to either independent condenser reheat coil or remote condenser. System must include receiver(s), subcooling condenser circuit(s) and check valves.

.9 Units to have a minimum of 3 compressors.

.10 Provide low ambient controls for 59 °F (14 °C) operation.

.11 Provide optional compressor service valves for packaged units incorporating hermetic compressors.

.4 Cooling Control

.1 The controller shall automatically start in heating, free Cooling, or cooling mode based on continuously monitored ambient temperature and load requirements.

.2 The controller shall include an adjustable low limit set point for freeze protection to cease equipment operation in the event of low discharge temperature. If the discharge air temperature falls below the adjusted set point, the blowers will shut down and the outside air dampers shall close. The low limit bypass timer shall vary automatically depending on the thermal coefficient of the style of heat exchanger.

.3 If the discharge air temperature approaches the low limit set point, the controller shall automatically reduce the economizer minimum fresh air down to half of its original setting to compensate.

.4 As the ambient temperature falls, the controller shall automatically compensate for outside air thermal expansion by proportionally reducing the amount of outside air.

.5 Mechanical cooling shall be disabled below an adjustable low ambient temperature set point.

.6 The cooling function shall be disabled by a remote binary input contact.

.7 The controller may initiate the economizer/free cooling mode on an initial call for cooling with an adjustable minimum fresh air setting.

.5 Heating /cooling packaged Controls shall be integral and heating be the slave for proper acting controls with integration of either heating or cooling will be operational.

Heating shall be disabled above an adjustable ambient temperature set point.

The minimum heater protection when using the J-XM module as a secondary controller shall be a high temperature limit switch, an induced draft motor speed sensor, flame proving controls.

The JXM controller shall continuously monitor the pilot valve and flame relay operation.

The controller shall attempt up to 3 ignition attempts in the event of loss of flame signal before disabling equipment operation.

8. FACTORY SUPPLIED CONTROLS/WIRING

.1 Provide a system of motor control, including all necessary terminal blocks, motor contactors, motor overload protection, grounding lugs, control transformers, auxiliary contactors and terminals for the connection of external control devices or relays.

.2 Gas fired units shall also include high limit and combustion airflow switch.

.3 Fire alarm circuits (where required) shall be powered from a relay in unit circuitry.

.4 Factory installed and wired non-fused disconnect switch in CEMA/NEMA 3 weatherproof configuration.

.5 Rooftop unit shall come with a service receptacle mounted on the Unit. Wiring by Electrical.

.6 Automatic controls shall be housed in a control panel mounted in or on the air handling unit, which will meet that standard of the specific installation.

.7 The unit is intended on a standalone basis at the completion of the Project. The Unit shall come with the capability and components for future BAS/BMS connection to the City of Toronto Systems.

.1 Provide a Remote Control Panel in the Electrical Room to serve the Controls of the new AHU. Provide wiring in conduit between the Air Handling Unit and the Control Panel. Control Panel shall have monitoring lights.

.2 The AHU Manufacturer shall supply a Supply Air Temperature Sensor, Return Air Temperature Sensor and Return Air CO2 Sensor for field installation, wiring and galvanized conduit by the Mechanical Contractor. Wire all devices to the AHU and Remote Control Panel.

.3 The Mechanical Contractor shall supply and field install, wiring (in galvanized conduit) a pressure differential sensor in the supply air ductwork 20’ downstream of the Unit and wired back to the AHU and the Remote Control Panel.

.4 The Controls shall all be commissioned on site in coordination with the Owner’s Requirements by the Manufacturer. Provide four (4) hours or training on the new Control System to the Owner.

.5 The Control System by the AHU Manufacturer shall be capable of enabling/disabling the unit, setting and monitoring setpoints and complete unit operation as necessary for the Owner’s Requirements. The Remote Control Panel shall have an LCD Display.

END OF SECTION