

**MECHANICAL SPECIFICATION CONT.**

**SECTION 15600 GAS FIRED HEATING MAKE UP AIR UNIT (MAU-1)**

- c. THE BURNER ASSEMBLY SHALL BE A BLOW THROUGH POSITIVE PRESSURE TYPE WITH AN INTERMITTENT PILOT IGNITION SYSTEM TO PROVIDE A HIGH SEASONAL EFFICIENCY. FLAME SURVEILLANCE SHALL BE WITH A SOLID STATE PROGRAMMED FLAME RELAY C/W FLAME ROD. THE BURNER AND GAS TRAIN SHALL BE IN A CABINET ENCLOSURE. INSULATION IN THE BURNER SECTION SHALL BE COVERED BY A HEAT REFLECTIVE GALVANIZED STEEL LINER. ATMOSPHERIC BURNERS, OR BURNERS REQUIRING POWER ASSISTED VENTING ARE NOT ACCEPTABLE.
- d. UNITS SHALL INCLUDE 15:1 TURNDOWN (HT BURNER).
- 1. FILTERS
  - a. 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. PROVIDE 2" 30% EFFICIENT PLEATED FILTER.
- 6. DAMPERS
  - a. DAMPERS CONSTRUCTION SHALL INCLUDE BLADE ENDS SEALED WITH AN ADHESIVE BACKED FOAMED POLYURETHANE GASKETTING. OUTDOOR AIR DAMPERS ALSO INCLUDE AN ALL WEATHER PVC SEAL.
  - b. CAP OFF MIXING DAMPER BETWEEN EXHAUST/RETURN AND INTAKE TO AVOID CROSS CONTAMINATION.
- 6. PACKAGED COOLING
  - a. RESERVE SUFFICIENT SPACE FOR FUTURE DX COOLING AS REQUIRED.
- 7. ELECTRICAL
  - a. PROVIDE A UNIT MOUNTED NON-FUSED DISCONNECT SWITCH.
- 8. CONTROLS
  - a. PROVIDE DJM DISCHARGE AIR CONTROLLERS TO PROVIDE HEATING, ECONOMIZER (SET AT 100% OA) AND MECHANICAL COOLING (FUTURE) WITH SPACE RESET THROUGH THE DDC SYSTEM. UNIT SHALL BE COMPLETELY FACTORY WIRED & TESTED. THE FACTORY MOUNTED BACNET COMPATIBLE CONTROLLER SHALL BE USED AS AN INTERFACE.
  - b. VFD ACCEPTABLE MANUFACTURER: ABB.
  - c. EXHAUST FAN AND SUPPLY FAN SHALL BE INTERLOCKED.
- 9. MAKE/MODEL
  - a. ACCEPTABLE MAKE SHALL BE AN ENGINEERED AIR UNIT, DJ SERIES.

**SECTION 15800 HEATING, VENTILATION & AIR CONDITIONING**

- 1. PROVIDE SUPPLY AIR, RETURN AIR, AND EXHAUST AIR DUCT SYSTEMS AS SHOWN.
  - 2. PROVIDE 4" FLEXIBLE DUCT CONNECTIONS ON BOTH INLET AND OUTLET DISCHARGE SIDES OF EACH FAN, AIR HANDLING ROOFTOP UNIT, ETC.
  - 3. ALL DUCTWORK INSTALLATION SHALL BE PERFORMED IN ACCORDANCE WITH SMACNA LATEST EDITION DUCT STANDARDS.
  - 4. ALL OUTDOOR DUCTWORK SHALL BE TWO GAUGES HEAVIER THAN INDOOR DUCTWORK OF EQUAL SIZE.
  - 5. THE MECHANICAL SUBCONTRACTOR SHALL SUPPLY AND INSTALL ALL DUCTWORK INCLUDING APPURTENANCES, HANGERS, DAMPERS, ETC.
    - a. ALL EXPOSED ROUND DUCTWORK SHALL BE ROUND SPIRAL CONDUIT CONSTRUCTED OF ZINC COATED STEEL. ACCEPTABLE PRODUCT: UNITED SHEET METAL CO. SHOP FABRICATED DUCTWORK AND FITTINGS CONSTRUCTED IN A MANNER SIMILAR TO THE FACTORY TYPE SPECIFIED WILL BE ACCEPTED.
- |                |                |
|----------------|----------------|
| CONDUIT SIZE   | GAUGE OF METAL |
| 8" AND SMALLER | 26             |
| 9" TO 22"      | 24             |
- b. RECTANGULAR DUCTWORK SHALL BE CONSTRUCTED FROM GALVANIZED SHEET METAL OF THE FOLLOWING U.S. STANDARD GAUGES:
 

DUCTS UP TO 12" ON LONGEST DIMENSION	26 GA.
DUCTS 13" TO 28" ON LONGEST DIMENSION	24 GA.
  - 6. BALANCING DAMPERS SHALL BE CONSTRUCTED FROM GALVANIZED STEEL TWO GAUGES HEAVIER THAN THE DUCTWORK IN WHICH THEY ARE INSTALLED C/W LOCKING QUADRANT AND INDICATING DEVICE. INSTALL ON ALL TAKE-OFFS AT MAIN SUPPLY AND EXHAUST DUCTING AND/OR WHERE REQUIRED TO PROVIDE AN ADJUSTABLE, PROPERLY BALANCED SYSTEM. LOCATE DAMPERS TO ENSURE EASY ACCESS TO FINISHED SYSTEM.
  - 7. ALL DUCTWORK SHALL BE SEALED USING DURO-DYNE S-2 DUCT SEALER THROUGHOUT ALL SEAMS AND JOINTS.
  - 8. PROVIDE ACCESS DOORS WHERE REQUIRED FOR SERVICING OR OPERATING OF MECHANICAL EQUIPMENT.
  - 9. ELECTRIC DUCT HEATERS - CONSTANT VOLUME SYSTEM
    - a. SUPPLY AND INSTALL CSA APPROVED PM WRIGHT OPEN COIL ELECTRIC DUCT HEATERS AS PER PLANS, AND COIL SCHEDULES.
    - b. FRAME SHALL BE OF GALVANIZED COLD ROLLED STEEL C/W INTEGRAL CONTROL CABINET
    - c. OPEN-COIL NICKEL-CHROMIUM RESISTANCE WIRE ELEMENTS, DESIGNED FOR MINIMUM AIR FLOW, SHALL BE SUPPORTED ON CERAMIC BUSHINGS HELD IN RIGID SUPPORT BRACKETS.
    - d. DUCT HEATERS SHALL BE EITHER FLANGE TYPE (WXF) FOR ATTACHMENT TO EXTERNAL DUCT FLANGES OR INSERT TYPE FOR INSERTION INTO SIDE OF DUCT.
    - e. BUILT-IN PRIMARY, AUTOMATIC RECYCLING CUTOUTS SHALL BE SUPPLIED IN ALL HEATERS. HEATERS BELOW 30KW AND BELOW 300 VOLTS SHALL BE SUPPLIED WITH BUILT-IN SECONDARY MANUAL RESET CUTOUTS. THEY SHALL BE OF DISC TYPE FOR HORIZONTAL AIRFLOW INSTALLATION AND LINEAR IN ALL HEATERS OVER 20 SQ.FT. ON VERTICAL AIR FLOW APPLICATIONS.
  - 10. THE FOLLOWING DEVICES SHALL BE SUPPLIED WITH THE UNITS AND PRE-WIRED BY THE MANUFACTURER.
    - a. PRIMARY AUTOMATIC AND SECONDARY MANUAL THERMAL HIGH LIMIT SAFETY CUTOUTS.
    - b. SAFETY INLET SCREEN
    - c. FUSED 24V CONTROL TRANSFORMER
    - d. MAGNET CONTACTORS
    - e. DUCT PRESSURE DIFFERENTIAL SWITCH
    - f. SCR C/W MODULATING OUTPUT CONTROLLED BY SPACE THERMOSTAT.
    - g. ALL NECESSARY PNEUMATIC/ELECTRIC TRANSDUCERS, RELAYS AND SWITCHES AS REQUIRED

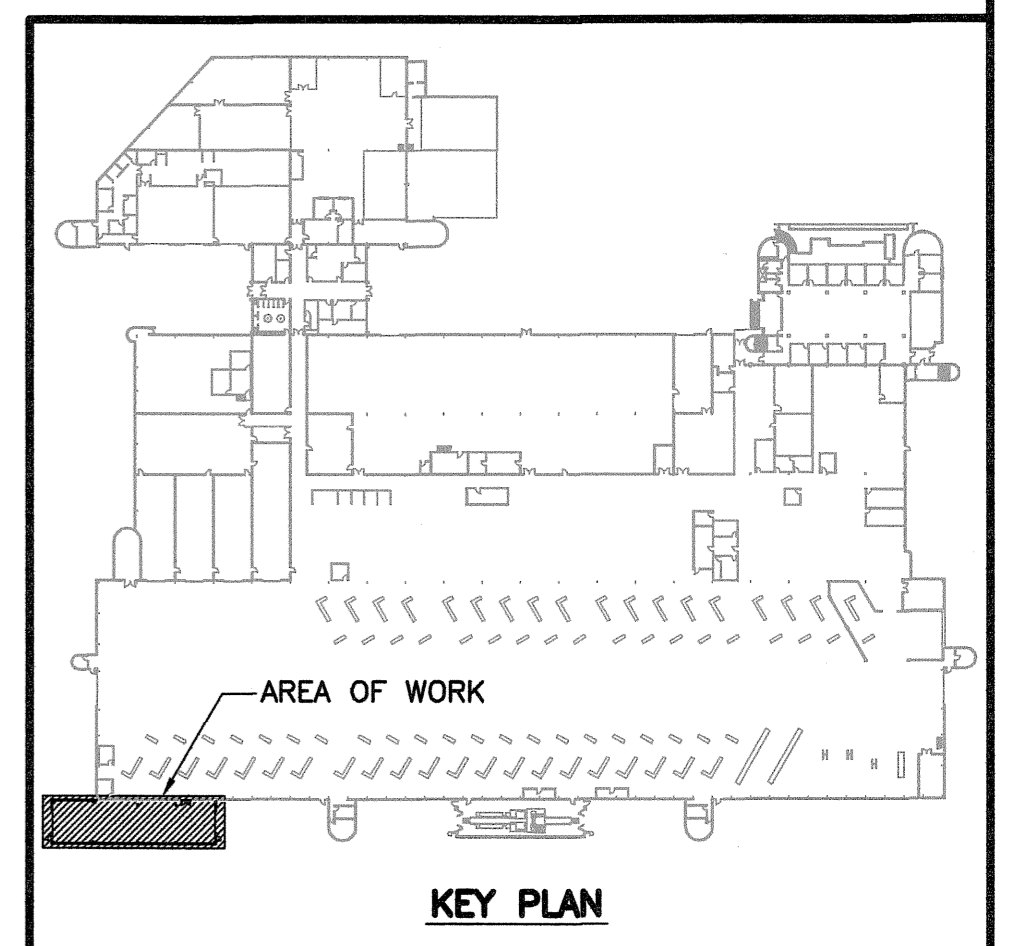
- TO INTERFACE WITH NEW OR EXISTING BUILDING CONTROL SYSTEMS. CONTRACTOR/EQUIPMENT SUPPLIER SHALL COORDINATE WITH CONTROLS CONTRACTOR PRIOR TO SUBMITTING SHOP DRAWINGS.
- h. C/W NON-FUSED DISCONNECT SWITCH.
- 11. VEHICLE TAIL EXHAUST AIR DUCTWORK
  - 11.1. SIZES UP TO 914mm (36") TO BE ZINC-COATED STEEL STRIP, SPIRAL CONDUIT OR ROUND.
  - 11.2. CONSTRUCT SPIRAL SIZES UP TO 203mm (8") OF .50mm (#26 GA.) WITH RIBS SPACED 63mm (2-1/2") TO 100mm (4") APART. SIZES FROM 228mm (9") TO 609mm (24") TO BE OF .60 (#24 GA.) WITH RIBS SPACED 150mm (6") APART. SIZES 609MM (26") TO 914mm (36") OF .80 (#22 GA.) WITH RIBS SPACED 150MM (6") APART.
  - 11.3. ROUND DUCT TO HAVE GROOVED LONGITUDINAL SEAMS WITH CONTINUOUS WELD.
  - 11.4. SECTIONS JOINED BY 200mm (8") COUPLING SLEEVES.
  - 11.5. FITTING MANUFACTURED BY UNITED. ALL TEES SHALL BE CONICAL.
  - 11.6. DUCTWORK SHALL BE CONSTRUCTED OF NOT LESS THAN 1.2mm (#18 GA.) GALV. IRON SHEETS.
  - 11.7. ALL COMPONENTS AND ACCESSORIES SHALL BE SUITABLE FOR 500°C APPLICATION.

**SECTION 15900 CONTROLS AND SEQUENCES**

- 1. ALL CONTROLS SHALL BE SUPPLIED AND INSTALLED BY MECHANICAL SUBCONTRACTOR. ALL WIRING 50 VOLTS AND ABOVE FOR MECHANICAL EQUIPMENT SHALL BE PERFORMED BY ELECTRICAL SUBCONTRACTOR. MECHANICAL SUBCONTRACTOR TO PROVIDE WIRING DIAGRAMS.
  - 2. ALL THERMOSTATS SHALL BE PROGRAMMABLE TYPE DIGITAL READOUT AND DISPLAY C/W LOCKABLE TAMPERPROOF METAL COVERS, NIGHT-SETBACK, AND SUB-BASE.
  - 3. PROVIDE ALL TRANSFORMERS, SOLENOIDS, WIRING, AND ANY OTHER HARDWARE (SPECIFICALLY INDICATED OR NOT) AS REQUIRED IN ORDER TO COMPLETE A FULLY FUNCTIONING CONTROL SYSTEM COMPATIBLE WITH THE NEW AND EXISTING SYSTEMS AND EQUIPMENT RELATED TO THIS PROJECT.
  - 4. CO/NO2 GAS DETECTION
    - 4.1. CENTRALIZED CONTROL PANEL
      - 4.1.1. PANEL SHALL BE 120 VAC. CONFIRM THE EXACT LOCATION WITH THE CITY.
      - 4.1.2. THE PANEL SHALL BE COMPATIBLE TO JOHNSON METASYS CONTROL SYSTEM.
      - 4.1.3. PANEL SHALL BE INTERLOCKED WITH MAU-01 EXHAUST/SUPPLY FAN.
      - 4.1.4. PANEL TO INCLUDE:
        - 4.1.4.1. GREEN LIGHT LABELLED 'POWER' INDICATING PANEL IS POWERED AND OPERATING CORRECTLY.
        - 4.1.4.2. GREEN LIGHT INDICATING CONTAMINANT LEVELS ARE BELOW 1ST LEVEL SET POINT (50 PPM CO AND/OR 1 PPM NO2) AT ALL SENSORS.
        - 4.1.4.3. AMBER LIGHT INDICATES THAT GAS CONCENTRATIONS HAVE EXCEEDED 1ST LEVEL SET POINT AT A MINIMUM OF ONE SENSOR.
        - 4.1.4.4. RED LIGHT INDICATES THAT GAS CONCENTRATIONS HAVE EXCEEDED 2ND LEVEL SET POINT (200PPM CO AND/OR 4 PPM NO2) AT A MINIMUM OF ONE SENSOR.
        - 4.1.4.5. SENSOR STATUS, AND GAS CONCENTRATION INDICATORS
    - 4.1.5. DESIGN OPERATING CONDITIONS: 5-95% RELATIVE HUMIDITY AND TEMPERATURE RANGES OF -20° C TO 40° C.
  - 4.2. GAS DETECTORS
    - 4.2.1. DETECTORS TO BE 24VDC, COMPLETE WITH 120/24V TRANSFORMER. REFER TO MANUFACTURER'S INSTRUCTION FOR LOCATION AND QUANTITY REQUIREMENT.
    - 4.2.2. SINGLE SENSOR BODY SHALL BE CAPABLE OF DETECTING BOTH CO AND NO2.
    - 4.2.3. TO BE CONNECTED TO CENTRALIZED CONTROL PANEL
    - 4.2.4. DESIGN OPERATING CONDITIONS: 5-95% RELATIVE HUMIDITY AND TEMPERATURE RANGES OF -20° C TO 40° C.
  - 4.3. SET POINTS (ADJUSTABLE) AS FOLLOWS:
    - 4.3.1. 1ST ALARM SETPOINT: CO @ 50 PPM/ NO2 @ 0.7 PPM
    - 4.3.2. 2ND ALARM SETPOINT: CO @ 100 PPM/ NO2 @ 2.0 PPM
  - 4.4. ACCEPTABLE MANUFACTURERS:
    - 4.4.1. CRITICAL ENVIRONMENT TECHNOLOGIES
    - 4.4.2. HONEYWELL
    - 4.4.3. ENMET
5. GENERIC INPUT/OUTPUT FOR METASYS CONTROL
  - 5.1. CONTROLS MUST BE ABLE TO INTERFACE TO MSEA TECHNOLOGY ON THE FIELD DEVICE NETWORK USING BACNET PROTOCOLS.
  - 5.2. CONTROLS CONTRACTOR TO PROVIDE COMMISSIONING SHEETS FOR ALL POINTS ON FIELD DEVICES AS WELL AS HEAD END EQUIPMENT.
  - 5.3. CONTROLS CONTRACTOR TO COMMUNICATE WITH EQUIPMENT PROVIDER TO ENSURE PROPER FIELD POINT INTEGRATION AS WELL AS CONTROLLABILITY OF THE EQUIPMENT AND PROVIDE FIELD CONTROLLER AS REQUIRED.
  - 5.4. IF NOT A METASYS PRODUCT INSTALLED, THE CONTROLS CONTRACTOR MUST SHOW SEAMLESS INTEGRATION INTO THE EXISTING METASYS EXTENDED ARCHITECTURE OPERATOR INTERFACE THAT IS ACCEPTABLE TO CITY STAFF PRIOR TO THE AWARD OF THE CONTRACT.
  - 5.5. CONTROLS CONTRACTOR TO SUPPLY ALL DRAWINGS/GRAPHICS/SEQUENCE OF OPERATIONS IN BOTH A HARD AND SOFT COPY. DRAWINGS AND GRAPHICS TO BE ABLE TO BE READ AND MODIFIED BY CITY OF WINNIPEG STAFF. USER INTERFACE GRAPHICS TO BE COMPLETED USING GRAPHIC GENERATION TOOL SOFTWARE. GRAPHICS MUST USE CITY OF WINNIPEG GRAPHIC TEMPLATES. CONTRACTOR TO SUPPLY AS-BUILT DRAWINGS IN AN EDITABLE FORMAT, ABLE TO BE EASILY EDITED BY CITY OF WINNIPEG STAFF.
  - 5.6. THE USE OF EITHER N2OPEN OR BACNET TO BE DETERMINED BASED ON TYPE OF BUILDING WHERE THE WORK IS BEING PERFORMED. IF THE CONSTRUCTION IS A BRAND NEW FACILITY, THEN BACNET CAN BE USED. THE TERM BACNET SHOULD THEN BE DEFINED PROPERLY IN IT'S USE. IF THE WORK IS AN ADDITION TO AND THE NEW WORK IS TO BE TIED INTO THE EXISTING CONTROLS, THEN THE CONTRACTOR SHOULD CONTACT CITY OF WINNIPEG TECHNICAL STAFF TO DETERMINE THE BEST PROTOCOL TO USE BASED ON EXISTING EQUIPMENT.
  - 5.7. IF OTHER VENDOR (NON-JCI) CONTROLS ARE TO BE USED THEN A SEAMLESS INTEGRATION MUST BE PROVEN BEFORE APPROVAL WILL BE GIVEN.
  - 5.8. THE TERM BACNET REFERS TO AN INDUSTRY STANDARD PROTOCOL THAT BASICALLY STATES THAT ALL DEVICES USING THE BACNET TECHNOLOGY WILL BE ABLE TO COMMUNICATE TO EACH OTHER. THIS IS NOT NECESSARILY THE CASE. THE BACNET PROTOCOL IS COMPRISED OF SEVERAL LAYERS OF INTEROPERABILITY AND INTERCOMMUNICATIONS. THE CONTROLS CONTRACTOR PERFORMING THE SUPERVISORY CONTROLLER INSTALLATION SHOULD CONFIRM THAT ALL DEVICES SPECIFIED ARE ABLE TO COMMUNICATE TO THE PROPOSED DEVICES USING THE BACNET PIC STATEMENT AND THEN SUPPLY DOCUMENTATION SUCH THAT ALL DEVICES SUPPLIED WILL COMMUNICATE TO EACH OTHER AS REQUIRED FOR PROPER OPERATION OF THE SYSTEM. THIS INCLUDES INTEGRATION INTO THE ADX SERVER.
  - 5.9. IF METASYS NETWORK AUTOMATION ENGINES (NAE/NIE/NCE) ARE TO BE INSTALLED ON THE PROJECT THEN THE VERSION OF THESE DEVICES AND THEIR SOFTWARE MUST BE SUCH THAT THE CITY OF WINNIPEG DOES NOT BE REQUIRED TO UPDATE/UPGRADE THE EXISTING ADX SERVER IN ORDER FOR ALL USER VIEWS, ALARMS, AND POINT MONITORING

- TO OCCUR. THE CONTRACTOR MUST CO-ORDINATE WITH CITY STAFF TO DETERMINE THE CORRECT VERSION TO BE INSTALLED. ALL USER VIEWS AND GRAPHICS MUST NOT BE INSTALLED IN THE LOCAL SUPERVISORY CONTROLLER (NAE/NIE/NCE). ALL SUCH ITEMS MUST BE PROGRAMMED INTO THE EXISTING ADX SERVER. USER VIEWS AND GRAPHICS MUST BE APPROVED FOR USE BY CITY STAFF BEFORE IMPLEMENTATION OF SUCH ITEMS.
- 5.10. ALL MONITORED POINTS THAT HAVE ALARMS MUST HAVE OPERATING INSTRUCTIONS AND ALARM MESSAGES. THESE WILL BE CO-ORDINATED WITH THE TECH SHOP AND OPERATIONS SUPERVISOR.
- 6. FAN SYSTEM CONTROLS - GENERAL
  - 6.1. PROVIDE "FAIL-SAFE HARDWARE" (HARDWIRED) INTERLOCKS (CSR'S, DIFFERENTIAL PRESSURE SWITCHES, ETC.) TO ENSURE SYSTEM CONTROLS ENERGIZE AND ASSOCIATED EXHAUST FANS RUN WHEN SUPPLY FAN RUNS.
  - 6.2. PROVIDE ALL FAN SYSTEMS THAT INTRODUCE OUTSIDE AIR WITH LOW LIMIT CONTROL IN DISCHARGE AIR TO SHUT DOWN SUPPLY FAN WHEN DISCHARGE AIR TEMPERATURE DROPS BELOW 3°C. PROVIDE A PRESSURE DIFFERENTIAL SWITCH ON FILTER TO INDICATE FILTER PRESSURE STATUS AND ALARM AT THE BMS. 5% ACCURACY IS REQUIRED FOR FILTER STATIC SENSOR. FILTER ALARMS SHALL NOT BE REGISTERED WHEN FAN SYSTEM IS OFF.
  - 6.3. ON 100% O.A. SYSTEMS PROVIDE END SWITCH ON O.A. DAMPER BLADE TO ENSURE O.A. DAMPER IS FULLY OPEN PRIOR TO STARTING FAN.
  - 6.4. LOW LIMIT CONTROLLERS MOUNTED ON FAN SYSTEMS WILL BE WIRED TO SHUTDOWN THE FAN SYSTEM, INDEPENDENT OF THE BMS (HARDWIRED TO BOTH 'AUTO' AND 'HAND' POSITION OF THE FAN STARTER). THE LOW LIMIT WILL ALSO PROVIDE CONTACT TO THE BMS WHICH WILL INITIATE A LOW TEMPERATURE ALARM. WHEN THE LOW LIMIT CONDITION OCCURS, ALL OTHER ALARMS ON THE FAN SYSTEM, SUCH AS FAN FAIL ALARMS WILL NOT BE GENERATED BY THE BMS.
  - 6.5. ALL FAN SYSTEMS WILL HAVE A TIME SCHEDULE PROGRAM. ALL THE START/STOP TIMES WILL BE DISPLAYED ON THE SYSTEM GRAPHIC WHICH WILL BE IDENTIFIED AS 'TIME SCHEDULE'. THE SYSTEM OPERATORS WILL BE ABLE TO SELECT AND ADJUST ONLY START AND STOP TIME FOR ANY DAY OF THE WEEK. THE SYSTEM OPERATORS WILL BE ABLE TO SELECT THE FAN SYSTEM TO OPERATE FROM THE TIME SCHEDULE CONTINUOUS ON, OR CONTINUOUS OFF (HOA) THROUGH THE SYSTEM GRAPHICS.
  - 6.6. ALL VALUES STATED SHALL BE FIELD ADJUSTABLE. LOCAL CONTROLLERS SHALL ALLOW OPERATOR TO ACCESS ALL CONNECTED INPUT POINTS, OPERATOR COMMANDABLE POINTS AND OPERATOR SELECTABLE PARAMETERS AND SET POINTS.
  - 6.7. THE BMS SHALL PROVIDE FOR HIGH/LOW TEMPERATURE ALARMS ON ALL TEMPERATURE SENSORS LISTED IN THE ANALOG INPUT LIST.
- 7. VEHICLE EXHAUST SYSTEM
  - 7.1. VEHICLE TAIL EXHAUST FAN (F-1)
    - 7.1.1. EXHAUST FANS ON EXHAUST HOSE SHALL BE ACTIVATED BY WALL MOUNTED HAND SWITCHES. CONFIRM SWITCH LOCATIONS WITH THE CITY.
  - INPUT/OUTPUT POINTS F-1:
    - .1 BINARY INPUTS:
      - .1 EXHAUST FAN STATUS
    - .2 BINARY OUTPUTS
      - .1 EXHAUST FAN ON/OFF
  - 7.2. GAS DETECTION (CO, NO2)
    - 7.2.1. GAS DETECTORS ARE TO BE CONNECTED TO A MAIN CONTROL PANEL WITH TWO LEVEL ALARM OUTPUTS.
      - 7.2.2. GAS DETECTOR LOCATIONS
        - 7.2.2.1. DETECTOR AT 1.2 M A.F.F.
        - 7.2.2.2. DETECTOR AT TRUSS LEVEL
    - 7.3. GAS DETECTOR PANEL (CONFIRM LOCATION WITH THE CITY)
      - 7.3.1. ANY GAS DETECTOR READING 50 PPM CO - AMBER LIGHT: ON
      - 7.3.2. ANY GAS DETECTOR READING 100 PPM CO - RED LIGHT: ON AND HORN/STROBE: ON
      - 7.3.3. ANY GAS DETECTOR READING 0.7 PPM NO2 - AMBER LIGHT: ON
      - 7.3.4. ANY GAS DETECTOR READING 2 PPM NO2 - RED LIGHT: ON AND HORN/STROBE: ON
      - 7.3.5. ANALOG OUTPUT SHALL BE INTERLOCKED WITH THE BMS AND FIREALARM SYSTEM.
- 8. BUILDING STATIC PRESSURE CONTROL
  - 8.1. THE STATIC PRESSURE TIP SHALL BE PROVIDED AT THE EXTERIOR OF THE BUILDING TO SENSE LOCAL STATIC PRESSURE OF THE BUILDING.
  - 8.2. PRESSURE TIP USED ON THE BUILDING EXTERIOR SHALL ISOLATE THE STATIC PRESSURE FROM VELOCITY (WIND) PRESSURE TO PROVIDE A RELIABLE AND ACCURATE STATIC PRESSURE REFERENCE.
  - 8.3. PROVIDE SHOP DRAWINGS OF PROPOSED TIP ASSEMBLY AND MOUNTING INCLUDING ALL BRACING AS PART OF SHOP DRAWING PACKAGE.
  - 8.4. EXHAUST FAN SPEED (IN MAU-1) WILL BE MODULATED TO MAINTAIN THE PRESSURE IN EXHAUST AIR PLENUM. THE RELIEF AIR DAMPER POSITION WILL BE ADJUSTED TO MAINTAIN NEUTRAL PRESSURIZATION BETWEEN THE CONDITIONED SPACE AND THE ATMOSPHERE.
- 9. FIRE ALARM INTEGRATION - GENERAL
  - 9.1. HARDWIRED FIRE ALARM INTERLOCKS SHALL BE PROVIDED MAU-01 MOTOR STARTERS.
  - 9.2. INTERCONNECTION TO FIRE ALARM INTERLOCK RELAYS SHALL BE PROVIDED TO ALLOW THE BMS TO BE NOTIFIED OF A FIRE ALARM CONDITION.
- 10. MAKEUP AIR UNIT
  - 10.1. MAU-1 IS A 100% FRESH AIR UNIT THAT PROVIDES VENTILATION AIR TO THE NEW ADDITION. THE UNIT IS MADE UP OF A VARIABLE VOLUME FAN SYSTEM AND INDIRECT GAS FIRED HEAT EXCHANGER.
  - 10.2. THE MANUFACTURER OF THE EQUIPMENT SHALL PROVIDE BACNET PROTOCOL PACKAGED CONTROLLER COMMUNICATING WITH BMS SEAMLESSLY.
  - 10.3. INPUT/OUTPUT POINTS MAU-01:
    - 10.3.1. ANALOG INPUTS:
      - 10.3.1.1. OUTSIDE AIR TEMPERATURE
      - 10.3.1.2. SUPPLY AIR TEMPERATURE
      - 10.3.1.3. SUPPLY FAN STATIC PRESSURE
      - 10.3.1.4. OUTSIDE AIR STATIC PRESSURE
      - 10.3.1.5. SPACE STATIC PRESSURE
      - 10.3.1.6. SUPPLY AIR FLOWRATE
      - 10.3.1.7. EXHAUST FAN PLENUM PRESSURE
      - 10.3.1.8. SUPPLY FAN VFD OUTPUT
      - 10.3.1.9. EXHAUST FAN VFD OUTPUT
    - 10.3.2. ANALOG OUTPUTS:
      - 10.3.2.1. GAS CONTROL VALVE POSITION
      - 10.3.2.2. SUPPLY FAN VFD CONTROL
      - 10.3.2.3. EXHAUST FAN VFD CONTROL
      - 10.3.2.4. RELIEF AIR DAMPER

REFERENCE DRAWINGS	
NO.	DESCRIPTION



NO.	DATE	DESCRIPTION	PREPARED	REVIEW	DESIGN	AUTHORIZED
00	14.01.17	ISSUED FOR CONSTRUCTION	DD	JS	TS	JS

PROVINCE OF MANITOBA  
2014-01-17  
T. SUN  
Member  
33181  
REGISTERED PROFESSIONAL ENGINEER

**APEGM**  
Certificate of Authorization  
**TETRA TECH WEI Inc.**  
No. 5313 Date: April 30, 2014

DESIGNED BY: TS	PREPARED BY: EV	REVIEWED BY: JS
AUTHORIZED SIGNATURE: [Signature]	DATE: 13.11.20	SCALE: AS NOTED

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CLIENT: **CITY OF WINNIPEG TRANSIT DEPARTMENT**

**TETRA TECH**

PROJECT NAME: **CITY OF WINNIPEG TRANSIT - FORT ROUGE GARAGE BUS MAINTENANCE ADDITION**

DRAWING DESCRIPTION: **MECHANICAL SPECIFICATIONS SHEET 2**

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