

**MECHANICAL SPECIFICATIONS:**

**1.0 GENERAL:**

**1.1 SCOPE OF WORK:**

- 1.1.1 THE SCOPE OF WORK FOR THIS PROJECT IS TO SUPPLY AND INSTALL ALL REQUIRED MECHANICAL ITEMS FOR COMPLETE AND OPERATIONAL VENTILATION SYSTEMS IN ACCORDANCE WITH THE INTENT OF THESE SPECIFICATIONS AND DRAWINGS AND ALL APPLICABLE CODES. THESE ITEMS INCLUDE BUT ARE NOT LIMITED TO THE FOLLOWING:
- 1. REPLACE EXISTING AIR HANDLING UNIT AHU-1 AND ASSOCIATED REMOTE CONDENSING UNIT CU-1 SERVING THE MAIN FLOOR.
- 2. REPLACE EXISTING AIR HANDLING UNIT AHU-2 SERVING THE BASEMENT LEVEL.
- 3. REPLACE EXISTING AIR MAKEUP UNIT AMU-1 SERVING THE SECOND FLOOR.
- 4. SUPPLY AND INSTALL CONTROLS TO INTERLOCK NEW ROOFTOP UNITS AHU-1, AHU-2 AND AMU-1 WITH EXISTING EXHAUST FANS EF-1, EF-2 AND EF-3 TO MAINTAIN EXISTING CONTROLS SEQUENCE OF OPERATION.
- 5. REPLACE EXISTING ROOFTOP GAS PIPING WITH NEW.
- 6. COMMISSION ALL HVAC EQUIPMENT AND CONTROLS.
- 7. PROVIDE INSTRUCTIONS FOR THE DEPARTMENTAL REPRESENTATIVE FOR OPERATION AND MAINTENANCE OF ALL NEW EQUIPMENT AND CONTROLS AS DETAILED IN SECTION 210501.
- 8. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE NATIONAL BUILDING CODE 2010.

**1.2. SITE COORDINATION**

- 1.2.1. ACCESS TO THE SITE SHALL BE COORDINATED WITH THE DEPARTMENTAL REPRESENTATIVE.
- 1.2.2. PERMIT EQUIPMENT MAINTENANCE AND DISASSEMBLY WITH MINIMUM DISTURBANCE TO ADJACENT EQUIPMENT.

**1.3. INSPECTION AND TESTING**

- 1.3.1 THE WORK SHALL BE AT ALL TIMES AVAILABLE FOR INSPECTION BY THE DEPARTMENTAL REPRESENTATIVE.
- 1.3.2 ALL STARTUP AND TESTING SHALL BE PERFORMED IN THE PRESENCE OF THE DEPARTMENTAL REPRESENTATIVE. NOTICE OF THE DATE OF WHEN TESTS SHALL BE PERFORMED MUST BE RECEIVED BY THE DEPARTMENTAL REPRESENTATIVE.
- 1.3.3 WORK SHALL NOT BE INSULATED OR CONCEALED PRIOR TO BEING TESTED OR APPROVED.
- 1.3.4 OPERATE SYSTEM FOR A MINIMUM OF 3 DAYS TO ENSURE COMPLETE ACCEPTANCE; DEFECTS SHALL BE REMEDIATED AT CONTRACTOR'S EXPENSE.
- 1.3.5. USE OF NEW HVAC SYSTEMS DURING CONSTRUCTION:

- 1. NEW HVAC SYSTEMS SHALL NOT BE USED DURING CONSTRUCTION UNLESS APPROVED OTHERWISE BY THE DEPARTMENTAL REPRESENTATIVE. (OBTAIN WRITTEN APPROVAL FROM EXISTING CONTROLS SEQUENCE OPERATION.
- 2. IF THE DEPARTMENTAL REPRESENTATIVE APPROVES USE OF HVAC SYSTEMS, THE CONTRACTOR SHALL:
  - 1. ENSURE THAT HVAC SYSTEM IS OPERATED AS PER MANUFACTURER'S RECOMMENDATIONS AND INSTRUCTIONS.
  - 2. CONTINUOUSLY MONITOR SYSTEM.
  - 3. PERFORM REGULAR PREVENTATIVE AND OTHER MANUFACTURER'S RECOMMENDED MAINTENANCE ROUTINES AT CONTRACTOR'S OWN EXPENSE.
  - 4. NOT RELAX WARRANTIES AND GUARANTEES.
  - 5. REFURBISH ENTIRE SYSTEM BEFORE STATIC COMPLETION. CLEAN ALL DUCTWORK AND ALL AIR HANDLING EQUIPMENT INTERNALLY AND EXTERNALLY, RESTORE TO "AS NEW" CONDITION, REPLACE FILTERS IN AIR HANDLING SYSTEM.

**2.0. HVAC PRODUCT:**

**2.1. ACCESS DOORS:**

- 2.1.1. PRIME COATED STEEL ACCESS DOORS, PAINTED TO MATCH ADJACENT WALL. ROUNDED SAFETY CORNERS, CONCEALED HINGES, SAFETY SCREWDRIVER LATCH, ANCHOR STRAPS, ABLE TO OPEN AT 180 DEG., MINIMUM SIZE FOR ENTRY 600mm x 600mm.

**2.2. DUCTWORK:**

- 2.2.1. CONFORM TO SMACNA STANDARDS FOR SUPPLY AND INSTALLATION OF DUCTWORK. PERFORM ALL WORK IN ACCORDANCE WITH ALL APPLICABLE CODES AND STANDARDS.
- 2.2.2. FOR ALL NEW ROOFTOP DUCTWORK, PROVIDE 2" THICK RIGID INSULATION C/W ASU.
- 2.2.3. DUCTWORK SHALL BE RATED FOR 1" W.C. SEAL ALL DUCTWORK JOINTS USING "DURO-DYNE" DUCT SEALER.
- 2.2.4. SEAL ALL JOINTS IN DUCT INSULATION VAPOR BARRIER USING TAPE AND DUCT SEALER.

**2.3. ROOFTOP UNITS:**

- 2.3.1. ROOFTOP UNITS SHALL BE ENGINEERED AIR, OUTDOOR DESIGN WITH PILLOW BLOCK BEARINGS, DOWN DISCHARGE, HINGED ACCESS DOORS, FLAT FILTER SECTIONS WITH 2" MERV 8 PLEATED FILTERS, INLET OR MIXING DAMPERS C/W OPERATOR, SUPPLY BLOWER, 1" C-1/2 LB/CU FT. INSULATION THROUGHOUT, 18 GA. CONSTRUCTION WITH GREY ENAMEL FINISH COAT. UNIT TO MATCH DIMENSIONS INDICATED ON THE DRAWINGS.
- 2.3.2 POWER SUPPLY TO ALL ROOFTOP UNITS TO BE AS INDICATED ON UNIT SCHEDULE, AND ALL ELECTRICAL EQUIPMENT ON UNITS TO HAVE A SHORT CIRCUIT WITHSTAND CAPABILITY OF 18KA, AND PROVIDED WITH A HAZARD NOTICE INDICATING POTENTIAL SHOCK OR ARC FLASH HAZARD. ALL MOTOR OVERLOADS SHALL TRIP ON SINGLE PHASING CONDITIONS. CONTROL POWER WHERE REQUIRED TO BE PROVIDED BY A CONTROL TRANSFORMER WITH PRIMARY AND SECONDARY FUSING, INTEGRAL TO THE UNIT AND POWERED FROM THE MAIN INCOMING POWER.
- 2.3.3. UNLESS OTHERWISE STATED, 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 CETL, ETU/UL OR CSA PRIOR TO SHIPMENT.
- 2.3.4. 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.
- 2.3.5. ALL UNITS MUST EXCEED THE ASHRAE 90.1 REQUIREMENT OF STEADY STATE EFFICIENCY AT LOW FIRE. 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. USING DUCT TYPE FURNACES AND CLOSED COUPLED BLOWERS ARE NOT ACCEPTABLE. THE HEAT EXCHANGER/BURNER ASSEMBLY SHALL BE A BLOW THROUGH POSITIVE PRESSURE TYPE AND SHALL HAVE AN INTERRUPTED PILOT IGNITION SYSTEM TO PROVIDE INCREASED SAFETY. UNITS USING CONTINUOUS OR INTERMITTENT PILOTS ARE NOT ACCEPTABLE.
- 2.3.6. FLAME SURVEILLANCE SHALL BE FROM THE MAIN FLAME AFTER IGNITION NOT THE PILOT FLAME. ATMOSPHERIC BURNERS OR BURNERS WITH POWER ASSISTED VENTING ARE NOT ACCEPTABLE.
- 2.3.7. THE HEAT EXCHANGER/BURNER ASSEMBLY SHALL INCLUDE 15:1 TURNDOWN 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.
- 2.3.8. PROVIDE ELECTRONIC DJM MODULE COMPLETE WITH PROPORTIONAL/INTEGRAL CONTROL AND DISCHARGE AIR SENSOR TO MAINTAIN SET POINT 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. TWO SPEED OR STEP SPEED COMBUSTION BLOWERS ARE NOT ACCEPTABLE.
- 2.3.9. THE DJM3 HEATING MODULE SHALL INCLUDE THE FOLLOWING STANDARD FEATURES:
  - SERVICE ANALYZER WITH DIAGNOSTIC LIGHTS FOR EASE OF SET-UP AND SERVICE.
  - -40 DEG. F. (-40 DEG. C.) MINIMUM OPERATING AMBIENT TEMPERATURE.
  - NON-RECYCLING AUTO BY-PASS LOW LIMIT WITH ALARM CONTACTS AND BUILT-IN SENSOR CHECKING.
  - SEPARATE GAS AND AIR ACTUATORS INDEPENDENTLY CONTROLLED TO GIVE THE CORRECT AIR TO FUEL RATIO THROUGH OUT THE ENTIRE FIRING RANGE.
- 2.3.10. COMBUSTION EFFICIENCY OF HIGH EFFICIENCY HEAT EXCHANGERS SHALL INCREASE BY UP TO 4-5% 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.
- 2.3.11. MAKE UP AIR UNITS SHALL INCORPORATE REVERSE AIRFLOW HIGH LIMIT SWITCH IN SERIES WITH THE STANDARD HIGH LIMIT SWITCH MOUNTED IN THE BLOWER DISCHARGE. UNIT TO COME COMPLETE WITH LOW LIMIT AUTO BYPASS CONTROLS.
- 2.3.12. DX COIL SHALL BE C/W ALTERNATE ROW CIRCUITING AND SHALL HAVE HOT GAS BYPASS ON THE LEAD COMPRESSOR. DX COIL REFRIGERANT SHALL BE R-407C.
- 2.3.13. CONDENSING UNITS SHALL BE ENGINEERED AIR MODEL CUEA112 AS LISTED AND SHALL BE C.S.A. APPROVED. CONDENSING UNITS SHALL BE DESIGNED FOR A MINIMUM OF 15 DEG. F. (8 DEG. C.) LIQUID SUB-COOLING. CONDENSING UNITS SHALL OPERATE DOWN TO 50 DEG. F. (10 DEG. C.) AS STANDARD. PROVIDE A MINIMUM OF 2 INDEPENDENT CIRCUITS FOR REDUNDANCY AND CAPACITY CONTROL MULTIPLE COMPRESSOR/CONDENSER CIRCUITS SHALL BE SEPARATE FROM EACH OTHER. SUCTION AND LIQUID LINES SHALL BE EXTENDED TO THE OUTSIDE OF THE CABINET. SERVICE PORTS FITTED WITH SCHRAEDER FITTINGS SHALL BE CONNECTED TO THE SUCTION AND DISCHARGE LINES FOR CHARGING OR PRESSURE GAUGE READINGS.
- 2.3.14. CONTROLS FOR HERMETIC COMPRESSOR UNITS SHALL INCLUDE COMPRESSOR AND CONDENSER FAN MOTOR CONTACTORS, CONTROL CIRCUIT TRANSFORMER, COOLING RELAYS, CRANKCASE HEATER, RECYCLING PUMP DOWN RELAYS, AMBIENT COMPRESSOR LOCKOUT, HIGH PRESSURE CONTROLS AND AUTOMATIC RESET LOW PRESSURE CONTROLS. HEAD PRESSURE ACTUATED FAN CYCLING CONTROL SHALL BE PROVIDED ON ALL DUAL CONDENSER FAN UNITS.
- 2.3.15. UNIT MUST CONFORM TO REGULATIONS SET OUT IN THE CANADIAN ENERGY EFFICIENCY ACT FOR LARGE AIR CONDITIONERS (CONDENSING UNITS).
- 2.3.16. PROVIDE HOT GAS BYPASS CONNECTION ON THE LEAD COMPRESSOR (BY CONTRACTOR). REFRIGERATION SPECIALTIES SUCH AS SOLENOID VALVES, TX VALVES, FILTER/DRYER, SIGHT GLASS, ETC., TO BE SUPPLIED AND INSTALLED BY REFRIGERATION CONTRACTOR.
- 2.3.17. PROVIDE A T7600, 2 STAGE HEAT/2 STAGE COOL THERMOSTAT FOR ROOM CONTROL. PROVIDE A REMOTE PANEL C/W UNIT ON/OFF SWITCH AND LIGHT, HEAT ON SWITCH AND LIGHT.

**2.3. ROOFTOP UNITS CONT.:**

**2.3.1. UNIT SCHEDULE:**

AHU-1: MAIN FLOOR AIR HANDLING UNIT MODEL DJ40/C/O, 4,200 CFM AT 1.0" ESP, 360 MBH INPUT, 284 MBH OUTPUT, 63 DEGREE HEATING TEMPERATURE RISE, 3 H.P. SUPPLY FAN MOTOR, 240/3/60 ODP MOTOR, 9.3 FLA, 16.4 MCA, 15/15 FORWARD CURVE BLOWER. DX COOLING COIL.

CU-1: MAIN FLOOR CONDENSING UNIT MODEL CUE112 CONDENSING UNIT, 80/67 EAT, 58.9/57.5 LAT, 128 MBH TOTAL COOLING 47.7 SST, 2 CIRCUITS.

AHU-2: BASEMENT AIR HANDLING UNIT MODEL DJ40/O, 2,100 CFM AT 1.0" ESP, 200 MBH INPUT, 160 MBH OUTPUT, 70 DEGREE HEATING TEMPERATURE RISE, 1.5 H.P. SUPPLY FAN MOTOR, 240/3/60 ODP MOTOR, 4.8 FLA, 10.8 MCA, 12/12 FORWARD CURVE BLOWER.

AMU-1: SECOND FLOOR AIR MAKEUP UNIT MODEL DJ20/O, 1,235 CFM AT 1.0" ESP, 200 MBH INPUT, 160 MBH OUTPUT, 70 DEGREE HEATING TEMPERATURE RISE, 1 H.P. SUPPLY FAN MOTOR, 240/3/60 ODP MOTOR, 3.2 FLA, 8.8 MCA, 9/9 FORWARD CURVE BLOWER.

**2.4. HVAC CONTROLS:**

2.4.1. THE CONTROLS CONTRACTOR SHALL BE IN THE CONTROLS BUSINESS SUCH AS BARCOL CONTROLS OR OTHER SIMILAR CONTRACTOR. SUBMIT SHOP DRAWINGS FOR APPROVAL WITH DETAILED SEQUENCE OF OPERATION FOR ALL SYSTEMS. REFER TO MECHANICAL DRAWINGS FOR ADDITIONAL DETAILS.

**2.4.2. SCOPE OF WORK AND SEQUENCE OF OPERATION:**

REFER TO DRAWING H02.

**2.4.3. THERMOSTATS:**

ALL THERMOSTATS SHALL HAVE A PROTECTIVE COVER OR ACCESS CODE TO PREVENT TAMPERING.

**2.5. AIR BALANCING:**

**2.5.1. SCOPE OF WORK:**

CONTACT DEPARTMENT REPRESENTATIVE PRIOR TO COMMENCEMENT OF BALANCING FOR FINAL INSTRUCTIONS.

TEST, ADJUST AND BALANCE AIR FLOWS FOR AHU-1, AHU-2 AND AMU-1.

TEST, ADJUST AND BALANCE AIR FLOWS FOR ALL EXISTING DIFFUSERS, REGISTERS AND GRILLES TO MATCH SCHEDULES FROM ORIGINAL INSTALLATION. PROJECT NO. 781438 SHEETS M3 AND M5 ARE PROVIDED WITH THIS PACKAGE FOR REFERENCE.

**2.5.2. GENERAL:**

FOLLOW STARTUP PROCEDURES AS RECOMMENDED BY THE DEPARTMENTAL REPRESENTATIVE, UNLESS OTHERWISE SPECIFIED. INSTALL SHEAVES IF REQUIRED TO ACHIEVE FINAL AIR BALANCE.

QUALIFICATIONS: PERSONNEL PERFORMING AIR BALANCING TO BE CURRENT MEMBER IN GOOD STANDING OF AABC.

QUALITY ASSURANCE: PERFORM AIR BALANCE UNDER DIRECTION OF SUPERVISOR QUALIFIED BY AABC.

REFERENCE STANDARDS: DO TAB OF COMPLETE MECHANICAL SYSTEMS OVER ENTIRE OPERATING RANGE IN ACCORDANCE WITH THE MOST STRINGENT CONDITIONS OF SELECT STANDARDS:

- 1. AABC (ASSOCIATED AIR BALANCE CONTROLS)
  - 2. SMACNA (SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION)
- ACCURACY: DO TAB WITHIN ±5% OF DESIGN VALUES.

INSTRUMENT CALIBRATION: TO BE IN ACCORDANCE WITH TAB REF. STANDARD, BUT WITHIN 3 MONTHS OF COMMENCEMENT.

REPORT: SUBMIT TAB REPORT TO DEPARTMENTAL REPRESENTATIVE FOR REVIEW. FORMAT TO BE IN ACCORDANCE WITH TAB SCHEMATICS SHOWN RESULTS OF TAB.

SUBMIT THREE (3) FINAL COPIES WITH REVIEW COMMENTS INCORPORATED.

**2.5.3. AIR MOVING SYSTEMS:**

GENERAL: MEASUREMENTS AS REQUIRED BY REFERENCED STANDARDS, INCLUDING BUT NOT LIMITED TO THE FOLLOWING MEASUREMENTS:

- 1. AIRFLOW
- 2. STATIC PRESSURE
- 3. BHP
- 4. AIR BALANCE NEW AHU-1, AHU-2 AND AMU-1 AS SPECIFIED
- 5. AIR BALANCE EXISTING DIFFUSERS, REGISTERS AND GRILLES

**3.0. PLUMBING PRODUCTS:**

**3.1. REFRIGERANT PIPING:**

REFRIGERANT PIPING SHALL BE HARD COPPER TO ASTM B280, THREADED FITTINGS TO BE WROUGHT COPPER, FLANGED FITTINGS TO BE BRONZE OR BRASS TO ASTM B16.22 COMPLETE WITH SUITABLE GASKETS AND APPROPRIATE ADHESIVE. SUPPORT PIPING ON NEOPRENE MANUFACTURED ROOF SUPPORTS. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CURRENT FEDERAL HALOCARBON REGULATIONS, MANITOBA REGULATION MR 103/94 AND THE OZONE DEPLETING SUBSTANCE ACT.

**3.2. REFRIGERANT PIPING INSULATION:**

INSULATE REFRIGERANT PIPING WITH 13mm THICK "ARMAFLEX" INSULATION

**3.3. CONDENSATE DRAIN PIPING:**

SCHEDULE 40 PVC OR INSULATED TYPE L COPPER

**3.4. NATURAL GAS PIPING:**

CONTRACTOR RESPONSIBLE FOR SIZING AND DESIGNING GAS DISTRIBUTION IN ACCORDANCE WITH THE NATURAL GAS INSTALLATION CODE CSA B149.1-10. SUPPORT PIPING ON NEOPRENE MANUFACTURED ROOF SUPPORTS. SUBMIT SHOP DRAWINGS FOR REVIEW. SCHEDULE 40 BLACK STEEL PIPE TO ASTM A53. SCREWED CONNECTIONS FOR 2" OR SMALLER. PAINT PIPING YELLOW AND LABEL.



DO NOT SCALE DRAWINGS		

Revision/	Description/Description	Date/Date
0	ISSUED FOR CONSTRUCTION	13/05/29

Client/client  
**PUBLIC WORKS AND GOVERNMENT SERVICES CANADA**  
100-167 LOMBARD AVENUE  
WINNIPEG MB R3C 2Z1

Project title/Titre du projet  
**REPLACEMENT OF AIR HANDLING UNITS OSBORNE CORRECTIONAL COMMUNITY CENTRE 1048 MAIN STREET, WINNIPEG, MB**

Approved by/Approve par  
RLG

Designed by/Concept par  
TJC

Drawn by/Desain par  
TJC

PWGSC Project Manager/Administrateur de Projets TPSCG  
TIM LODGE

PWGSC Architectural and Engineering Resources Manager/  
Ressources Architectural et de Directeur d'Ingénierie, TPSCG

Client/client

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