MECHANICAL DRAWING LIST M-100 MECHANICAL, LEGEND, SPECIFICATIONS, AND NOTES M-200 HVAC SYSTEM- FLOOR PLAN DUCTWORK DEMO M-300 HVAC SYSTEM- FLOOR PLAN AND DETAILS DUCTWORK NEW M-400 PIPING NEW FLOOR PLAN M-500 EQUIPMENT SCHEDULES AND SCHEMATICS CONTROLS SCHEMATIC AND SEQUENCES M-700 SPECIFICATIONS

GENERAL NOTES

- ALL DEMOLITION AND INSTALLATIONS SHALL BE IN ACCORDANCE WITH CODES. AMENDMENTS, BULLETINS ETC. AND REQUIREMENTS OF ALL INSPECTION AUTHORITIES FOR THE CITY OF OTTAWA.
- CONTRACTOR IS TO VERIFY LOCATIONS OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.
- ALL EXISTING UTILITIES AND SERVICES ARE TO BE MAINTAINED AND SUPPORTED BY THE CONTRACTOR TO THE SATISFACTION OF THE OWNER.
- ALL VALVES, DAMPER CONTROLS, ACCESS DOORS, TEST PORTS, AND FILTERS TO BE LOCATED SO THAT THEY ARE EASILY ACCESSIBLE. ALL GAUGES TO BE LOCATED AT EYE LEVEL.
- DO NOT SCALE DRAWINGS FOR INSTALLATION PURPOSES. OBTAIN ALL DIMENSIONS FROM ARCHITECTURAL PLANS, MANUFACTURER'S SHOP DRAWINGS, AND ON SITE INSPECTIONS.
- MECHANICAL, GENERAL AND ELECTRICAL TRADES SHALL WORK IN CONJUNCTION WITH ONE ANOTHER SO AS TO AVOID INTERFERENCES BETWEEN PIPING, DUCTWORK, CONDUIT, LIGHTING FIXTURES, ETC.
- CO-ORDINATE LOCATION OF NEW PIPING WITH EXISTING OR NEW SERVICES (PIPING, DUCTWORK, ELECTRICAL CONDUITS, LIGHTS AND BUILDING STRUCTURE). IF REQUIRED REMOVE EXISTING SERVICES AND REINSTALL. TEST SERVICES AFTER WORK IS COMPLETED.
- CHECK AND VERIFY LOCATION OF ALL PIPES, DUCTS AND EQUIPMENT WITH ALL OTHER TRADES TO PREVENT INTERFERENCE. REMOVAL OR RELOCATION OF ANY SUCH WORK INTERFERING WITH WORK OF OTHER TRADES IS THE RESPONSIBILITY OF THE MECHANICAL TRADE CONCERNED UNLESS OTHERWISE APPROVED IN WRITING.
- COORDINATE MECHANICAL WORK WITH PHASING PLAN, ENVIRONMENT CANADA PERSONNEL, ALL SPECIFICATIONS AND OTHER CONTRACTORS TO ENSURE ALL STRINGENT CONSTRUCTION PROCEDURES ARE FOLLOWED (INDLUDING CONTAINMENT PROCEDURES)

DUE TO INCONSISTENT RECORD OF EXISTING SERVICES NOT ALL DUCTWORK MAY BE SHOWN, OR IF SHOWN MAY NOT BE ACCURATE. IT IS THE CONTRACTORS RESPONSIBILITY TO VERIFY EXACT SIZE AND LOCATION OF ALL EXISTING SERVICES ON SITE AND SHALL REMOVE ALL REDUNDANT SERVICES IN THE AREAS OF CONSTRUCTION.

DEMOLITION NOTES

- DISCONNECT AND MAKE SAFE ALL MECHANICAL AND ELECTRICAL SERVICES REQUIRED TO BE REMOVED.
- CONTRACTOR SHALL REPAIR THE WALLS AND FLOORS AFFECTED BY THIS CONTRACT TO MATCH EXISTING.
- CONFORM TO ALL CODES AND OWNER'S PROCEDURES FOR DEMOLITION WORK. DUST CONTROL, PRODUCTS REQUIRING DISCONNECTION AND RECONNECTION.
- PROTECT FIRE ALARM AND LIFE SAFETY SYSTEMS DURING CONSTRUCTION.
- ARRANGE EXECUTION OF WORK TO MAINTAIN PRESENT BUILDING OPERATIONS. AND TO MINIMIZE THE EFFECT OF WORK UNDER THIS DIVISION ON EXISTING
- ALL DEMOLITION AND NEW INSTALLATION WORK SHALL CONFORM TO OCCUPATIONAL HEALTH AND SAFETY AND ENVIRONMENTAL REGULATIONS. ENSURE THAT ALL PARTIES ARE FAMILIAR WITH REQUIREMENTS AND EXPERIENCED IN THE WORK TO BE UNDERTAKEN.
- MAKE GOOD ALL SURFACES AND FINISHES IN AREAS FROM WHICH ITEMS HAVE BEEN REMOVED AND IN WHICH ITEMS ARE RELOCATED, CAP ALL EXISTING SERVICES REQUIRED TO BE SEVERED TO EFFECT ALTERATIONS AND DO ALL OTHER WORK NECESSARY TO MAKE GOOD SUCH AREAS TO SATISFACTION OF
- ALL EXISTING AIR INTAKE AND EXHAUST OPENINGS THAT MAY BE AFFECTED BY DUST AND/OR DEBRIS FROM THE CONSTRUCTION WORK SHALL BE FITTED WITH APPROPRIATE FILTER MEDIA TO PROTECT AGAINST ENTRY OF DUST AND/OR DEBRIS INTO THE BUILDING AND ITS AIR DISTRIBUTION SYSTEMS. FILTERS SHALL BE CLOSELY MONITORED AND REPLACED WHEN NECESSARY. THE CONTRACTOR SHALL REPLACE EXISTING FILTERS THAT BECOME CONTAMINATED WITH DUST AND/OR DEBRIS FROM CONSTRUCTION WORK WITH NEW FILTERS.
- PROTECT EXISTING EQUIPMENT AND SERVICES TO REMAIN FROM DEBRIS AND UNWANTED MATERIALS. CLEAN AS NECESSARY TO MAINTAIN SERVICE DURING DEMOLITION PERIOD AND ON COMPLETION OF THE WORK.
-). CONTRACTOR IS TO ENSURE THAT ALL EXISTING PIPING SERVING EXISTING AREAS REMAIN IN SERVICE UNTIL THESE AREAS ARE RECONNECTED TO NEW SERVICES. ONLY THEN OBSOLETE PIPING IS TO BE REMOVED AS SHOWN.
- CONTRACTOR IS TO ENSURE THAT ALL EXISTING REMOVED EQUIPMENT IS REMAIN THE PROPERTY OF THE OWNER, AND TO BE HANDED OVER TO THE OWNER.

EV (NIALIE)	DESCRIPTION EVISTING DIDING TO BEMAIN
LX (NAME)—	EXISTING PIPING TO REMAIN
—— RL ———	REFRIGERANT LIQUID
	REFRIGERANT SUCTION
c	CONDENSATE
—GLYS——	GLYCOL SUPPLY
GLYR	GLYCOL RETURN
<u> </u>	PIPING RISER UP
<u>_</u>	PIPING DROP
	UNION
· · · · · · · · · · · · · · · · · · ·	FLANGE
	FLEXIBLE CONNECTOR
	INLINE PUMP
	STRAINER
	3-WAY CONTROL VALVE
<u> </u>	2-WAY CONTROL VALVE
\longrightarrow	ISOLATING (SHUT-OFF) VALVE
	THROTTLING (BALANCING) VALVE
—— <mark>CBV</mark>	CIRCUIT BALANCING VALVE
	CHECK (FLOW CONTROL)
%	SAFETY (S) OR RELIEF (R) VALVE
 Хос	DRAIN COCK
 →	AUTOMATIC AIR VENT
	BACKFLOW PREVENTOR
<u> </u>	
	THERMOMETER
<u>`</u> ↓H	PRESSURE GAUGE AUTOMATIC AIR VENT
į×,	POSITIVE PRESSURE (SUPPLY) DUCT DOWN
ÎN,	NEGATIVE PRESSURE (RETURN) DUCT DOWN
	EXISTING DUCTWORK TO BE REMOVED
	EXISTING DUCTWORK TO REMAIN
1	NEW DUCTWORK
 	FULL RADIUS DUCT CONNECTION
 	TAP-IN DUCT CONNECTION
	ROUND DUCT CONNECTION
F PAPA	TURNING VANES
	SUPPLY AIR DIFFUSER (SQUARE)
	RETURN/EXHAUST GRILLE
	·
	TEMPERATURE SENSOR
FD	FIRE DAMPER
Н	HUMIDISTAT
CAP —	CAP
①	THERMOSTAT
BD	BALANCING DAMPER
MD	MOTORIZED DAMPER
 CFM	INDICATES EXISTING AIR OUTLET TO BE REBALANCED TO AIR QUANTITY INDICATED.
EX CFM	INDICATES EXISTING AIR OUTLET TO REMAIN.
as a server	
CTE	CONNECT TO EXISTING

COMMISSIONING SPECIFICATIONS

1.1 COMMISSIONING AGENCY

THE MECHANICAL ENGINEER HAS OVERALL RESPONSIBILITY FOR PLANNING AND COORDINATING THE COMMISSIONING PROCESS. COMMISSIONING INVOLVES ALL PARTIES TO THE DESIGN AND CONSTRUCTION PROCESS, INCLUDING THE CONTRACTOR AND HIS SUBCONTRACTORS AND SUPPLIERS.

1.2 DESCRIPTION OF WORK

THE PURPOSE OF THE COMMISSIONING PROCESS IS TO PROVIDE THE OWNER/OPERATOR OF THE FACILITY WITH ASSURANCE THAT THE MECHANICAL SYSTEMS HAVE BEEN INSTALLED ACCORDING TO THE CONTRACT DOCUMENTS, AND OPERATE WITHIN THE PERFORMANCE GUIDELINES SET OUT IN THE DESIGN INTENT DOCUMENTS AND THESE

SPECIFICATIONS. THE COMMISSIONING PROCESS DOES NOT TAKE AWAY OR REDUCE THE RESPONSIBILITY OF THE INSTALLING CONTRACTORS TO PROVIDE A FINISHED PRODUCT, INSTALLED AND FULLY FUNCTIONAL IN ACCORDANCE WITH THE CONTRACT

THE MECHANICAL CONTRACTOR, ALL SUB-CONTRACTORS AND SUPPLIERS, AND THE CONTRACTORS FOR OTHER DIVISIONS AND SECTIONS OF THE WORK SHALL BE RESPONSIBLE FOR COOPERATING, AND COORDINATING THEIR WORK, WITH THE MECHANICAL ENGINEER. THEY SHALL ALSO BE RESPONSIBLE FOR CARRYING OUT ALL THE PHYSICAL ACTIVITIES REQUIRED FOR INSTALLATION OF COMPONENTS AND SYSTEMS, AND OPERATING THEM DURING THE COMMISSIONING PROCESS AS REQUIRED IN THIS SECTION.

CONTRACTOR SHALL INCLUDE IN THE PROGRESS BILLING BREAKDOWN SUFFICIENT FUNDS FOR COMMISSIONING PERFORMANCE TESTING/VERIFICATION, TRAINING, AND POST CONSTRUCTION EVALUATION. THE MAJORITY OF THE FUNDS (85%) SHALL BE ALLOCATED TO PERFORMANCE TESTING AND VERIFICATION.

1.3 SYSTEMS TO BE COMMISSIONED

HVAC SYSTEMS UNDER THIS CONTRACT ARE TO BE INSPECTED, TESTED, AND SIGNED OFF AS COMPLETE AND OPERATIONAL, AND OPERATED FOR CONSULTANT VERIFICATION AS DESCRIBED IN PART 3 OF THIS SECTION. THIS INCLUDES, BUT IS NOT NECESSARY LIMITED TO THE WORK LISTED FOR EACH SYSTEM. THE FOREGOING INCLUDES ALL THE FOLLOWING:

- DUCT AND AIR HANDLING SYSTEMS WORK INCLUDES INSTALLATION INSPECTIONS AND CHECKS: CONFIRMATION OF FLOW BALANCING COMPLETION:
- LEAK TESTING AS APPLICABLE; SEISMIC RESTRAINS INSTALLATION CERTIFICATION REFRIGERATION COMPRESSOR/CONDENSING UNIT(S) --- WORK INCLUDES INSTALLATION INSPECTION AND CHECKS (INCLUDING SEISMIC RESTRAINTS INSTALLATION CERTIFICATION): CHECKOUT AND STARTUP BY MANUFACTURER'S REPRESENTATIVE AS SPECIFIÉD; DOCUMENTED PERFORMANCE MEASUREMENTS INCLUDING CAPACITY, EVAPORATOR AND CONDENSER PRESSURES, MOTOR CURRENT DRAW, AND CONTROLS OPERATION.
- PUMPS ---- WORK INCLUDES DOCUMENTED CHECKS ON ALIGNMENT. ROTATION MOTOR CURRENT DRAW, FLOWS AND PRESSURES.
- AIR TERMINAL DEVICES WORK INCLUDES INSTALLATION INSPECTION AND CHECKS: FOR VAV & CAV UNITS, FLOW ADJUSTMENTS AND CALIBRATION COORDINATED WITH CONTROLS AND AIR BALANCING: CONTROLS OPERATION INCLUDING FLOW MODULATION, REHEAT, CONTROL RESPONSES.
- DIRECT DIGITAL CONTROL SYSTEM --- WORK INCLUDES INSPECTIONS AND CHECKS OF INSTALLATION AND OPERATION OF ALL DEVICES; COMPLETE OPERATION OF CONTROL SEQUENCES, IN COORDINATION WITH COMMISSIONING OF ALL CONTROL SYSTEMS.
- AIR SAMPLING SYSTEM WORK INCLUDES INSTALLATION INSPECTION AND CHECKS OF ENTIRE AIR SAMPLING SYSTEM AND ITS COMPONENTS. AND INTEGRATION OF ASSOCIATED DEMAND-CONTROL VENTILATION SYSTEM.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR CARRYING OUT ALL WORK REQUIRED FOR COMMISSIONING THESE SYSTEMS THAT ARE DEFINED AS A CONTRACTOR'S RESPONSIBILITY IN PART 3 OF THIS SECTION.

PROVIDE SEASONAL TESTING AND FINE—TUNING AS REQUIRED DURING THE WARRANTY PERIOD.

3 EXECUTION

3.1 MECHANICAL ENGINEER'S RESPONSIBILITIES

THE MECHANICAL ENGINEER SHALL:

- PLAN, ORGANIZE AND IMPLEMENT THE COMMISSIONING PROCESS AS SPECIFIED
- PREPARE THE COMMISSIONING PLAN. ENSURE ITS DISTRIBUTION FOR REVIEW AND
- COMMENT; REVISE THE COMMISSIONING PLAN AS REQUIRED DURING CONSTRUCTION;
- 4. REVIEW CONTROLS POINT-TO-POINT CHECKS DONE BY THE CONTROLS
- CONTRACTOR WITNESS ALL INTEGRATED SYSTEM PERFORMANCE TESTS AND DOCUMENT THE
- RESULTS; PREPARE AND SUBMIT A COMMISSIONING REPORT WHICH DOCUMENTS ALL CHECKS AND TESTS DONE THROUGHOUT THE COMMISSIONING PROCESS. AND
- THEIR RESULTS

3.2 MECHANICAL CONTRACTOR'S RESPONSIBILITIES

THE MECHANICAL CONTRACTOR, AND ALL THE SUB-CONTRACTORS AND SUPPLIERS WITHIN DIVISION 23, SHALL COOPERATE WITH THE MECHANICAL ENGINEER, AND OTHER COMMISSIONING TEAM

MEMBERS, TO FACILITATE THE SUCCESSFUL COMPLETION OF THE COMMISSIONING PROCESS.

THE MECHANICAL CONTRACTOR, AND ALL MECHANICAL SUB-CONTRACTORS AND SUPPLIERS. SHALL COOPERATE WITH THE MECHANICAL ENGINEER IN CARRYING OUT THE HVAC COMMISSIONING PROCESS. IN THIS CONTEXT, THE MECHANICAL

- CONTRACTOR SHALL: EACH CONTRACTOR AND SUB-CONTRACTOR IN THIS DIVISION SHALL INCLUDE IN THEIR QUOTES THE COST OF PARTICIPATING IN THE COMMISSIONING PROCESS AS SPECIFIED HEREIN.
- PROVIDE INSTRUCTION AND DEMONSTRATIONS FOR THE OWNER'S DESIGNATED OPERATING STAFF. IN CONJUNCTION WITH THE MECHANICAL ENGINEER. AND WITH THE PARTICIPATION OF QUALIFIED TECHNICIANS FROM MAJOR EQUIPMENT SUPPLIERS AND THE CONTROLSCONTRACTOR.
- INCLUDE REQUIREMENTS FOR SUBMITTAL DATA. O&M DATA, AND TRAINING INFORMATION IN EACH PURCHASE ORDER OR SUB-CONTRACT WRITTEN. ENSURE COOPERATION AND PARTICIPATION OF SPECIALTY SUB-CONTRACTORS

SUCH AS SHEET METAL, PIPING, REFRIGERATION, AND AIR SAMPLING AS

ENSURE PARTICIPATION OF MAJOR EQUIPMENT MANUFACTURING IN APPROPRIATE

APPLICABLE. START-UP, TESTING AND TRAINING ACTIVITIES.

COMMISSIONING SPECIFICATIONS CONT'D

- NOTIFY THE MECHANICAL ENGINEER A MINIMUM OF ONE WEEK IN ADVANCE OF SCHEDULED EQUIPMENT AND SYSTEM START-UPS.
- PROVIDESUFFICIENT PERSONNEL TO ASSIST THE MECHANICAL ENGINEER AS
- REQUIRED DURING INTEGRATED SYSTEM TESTING, PRIOR TO START-UP, INSPECT, CHECK AND CONFIRM THE CORRECT AND
- COMPLETE INSTALLATION OF ALL EQUIPMENT AND SYSTEMS.
- PROVIDE EQUIPMENT AND SYSTEMS START-UP RESOURCES AS SPECIFIED AND
- CARRY-OUT PERFORMANCE CHECKS TO ENSURE THAT ALL EQUIPMENT AND SYSTEMS FULLY FUNCTIONAL AND READY FOR THE MECHANICAL ENGINEER TO WITNESS FORMAL INTEGRATED SYSTEM TESTS (ISTS).
- O. OPERATE EQUIPMENT AND SYSTEMS FOR ISTS IN ACCORDANCE WITH THE COMMISSIONING PLAN AND AS DIRECTED BY THE MECHANICAL ENGINEER.

IN THE EVENT THAT ANY SCHEDULED INTEGRATED SYSTEM TESTS (ISTS) ARE TERMINATED BECAUSE THE OWNER OR MECHANICAL ENGINEER DISCOVERS DEFICIENT OR INCOMPLETE WORK, OR DUE TO THE NON-ATTENDANCE OF REQUIRED CONTRACTOR OR SUPPLIER PERSONNEL, THE CONTRACTOR OR SUBCONTRACTOR RESPONSIBLE FOR THE TERMINATION SHALL ALSO BE RESPONSIBLE FOR PAYING REASONABLE COSTS OF TIME AND TRAVEL EXPENSES OF ANY OR ALL OF THE FOLLOWING REPRESENTATIVES WHO WERE PHYSICALLY PRESENT FOR THE PURPOSE OF WITNESSING THE START-UP OR THE IST: THE MECHANICAL ENGINEER, AND THE OWNER. THE OWNER MAY PROVIDE A STATEMENT TO THE MECHANICAL CONTRACTOR IDENTIFYING THE SPECIFIC ACTIVITY THAT WAS TERMINATED, THE SCHEDULED DATE, AND A LIST OF THOSE IN ATTENDANCE, ALONG WITH THEIR REASONABLE TIME AND TRAVEL EXPENSE COSTS.

3.3COMMISSIONING PLANNING

COMMISSIONING SHALL BE CARRIED AS A REGULAR ITEM IN THE CONSTRUCTION MEETINGS. NO DEDICATED COMMISSIONING MEETINGS SHALL BE HELD UNLESS DEEMED NECESSARY BY THE OWNER OR MECHANICAL ENGINEER DUE TO DEFICIENT WORK OR PROBLEMATIC SYSTEM OPERATION.

3.4MANUFACTURER'S START-UP DOCUMENTATION

CONTRACTOR SHALL SUBMIT MANUFACTURER'S BLANK START—UP FORM TEMPLATES TO CONSULTANT WITHIN TWO WEEKS OF AWARDING OF CONTRACT. AFTER SUCCESSFUL START-UP OF EQUIPMENT, CONTRACTOR SHALL SUBMIT COMPLETED START-UP FORMS TO MECHANICAL ENGINEER WITHIN ONE WEEK.

3.5INTEGRATED SYSTEM TESTING

ONCE THE INDIVIDUAL SYSTEM COMPONENTS HAVE BEEN SUCCESSFULLY STARTED UP AND VERIFIED BY THEIR INSTALLERS AND/OR MANUFACTURERS' REPRESENTATIVES. THE MECHANICAL CONTRACTOR SHALL SUBMIT THE COMPLETED STAR-TUP DOCUMENTATION TO THE MECHANICAL ENGINEER AND NOTIFY THAT THE SYSTEM IS READY FOR INTEGRATED TESTING. UPON SATISFACTORY REVIEW OF THE START-UP DOCUMENTATION, THE MECHANICAL ENGINEER SHALL SCHEDULE AN INTEGRATED SYSTEM TEST.

THE INTEGRATED SYSTEM TESTING (IST) SHALL BE A JOINT EFFORT BETWEEN THE MECHANICAL CONTRACTOR AND HIS SUBCONTRACTORS, THE AIR SAMPLING SYSTEM MANUFACTURER (OR MANUFACTURER'S REPRESENTATIVE), AND THE MECHANICAL ENGINEER. THE MECHANICAL ENGINEER SHALL PROVIDE TESTING FORMS FOR INTEGRATED SYSTEM TESTING AT LEAST TWO WEEKS PRIOR TO SCHEDULED INTEGRATED SYSTEM TESTING.

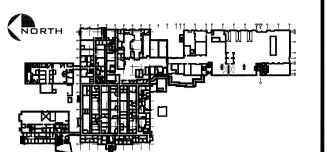
CONTRACTOR SHALL OPERATE EQUIPMENT AND SYSTEMS FOR ISTS IN ACCORDANCE WITH THE COMMISSIONING PLAN AND AS DIRECTED BY THE MECHANICAL ENGINEER.IN THE EVENT OF DEFICIENT OR INCOMPLETE WORK PREVENTING A SUCCESSFUL IST. THOSE RESPONSIBLE FOR DEFICIENT OR INCOMPLETE WORK WILL BE RESPONSIBLE FOR COSTS IN ACCORDANCE WITH 3.2 IN THIS SECTION.

3.6 O&M STAFF TRAINING

- CONTRACTOR SHALL PREPARE A PRELIMINARY SCHEDULE FOR MECHANICAL SYSTEM ORIENTATION AND INSPECTIONS.
- O&M MANUAL SUBMISSION, TRAINING SESSIONS, PIPE AND DUCT SYSTEM TESTING, FLUSHING AND CLEANING, EQUIPMENT START-UP TAB, AND TASK COMPLETION FOR USE BY THE MECHANICAL ENGINEER.
- UPDATE SCHEDULE AS APPROPRIATE THROUGHOUT THE CONSTRUCTION PERIOD.
- 4. ATTEND INITIAL O&M STAFF TRAINING SESSION.
- CONDUCT MECHANICAL SYSTEM ORIENTATION AND INSPECTION AT THE EQUIPMENT PLACEMENT COMPLETION STAGE.
- PARTICIPATE IN, AND SCHEDULE VENDORS AND CONTRACTORS TO PARTICIPATE IN THE O&M STAFF TRAINING SESSIONS AS SET-UP BY THE MECHANICAL ENGINEER.

Environment Canada Environnement Canada

Property Management Gestion de l'immobilier District 1 District 1



BUILDING KEY PLAN

LEGEND

REISSUED FOR TENDER 28-NOV-2014 ISSUED FOR TENDER 26-FEB-2014 REV Description Date



LONDON · HAMILTON · WINDSOR · OTTAWA 1130 MORRISON DRIVE, SUITE 260, OTTAWA, ON K2H 9N6

CONSULTING STRUCTURAL/MECHANICAL/ELECTRICAL ENGINEERS

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ENVIRONMENT CANADA MODULE 5 VRF

> SYSTEM **ENVIRONMENT CANADA** 335 River Rd

Ottawa ON. K1V 1C7

MECHANICAL LEGEND. SPECIFICATIONS.

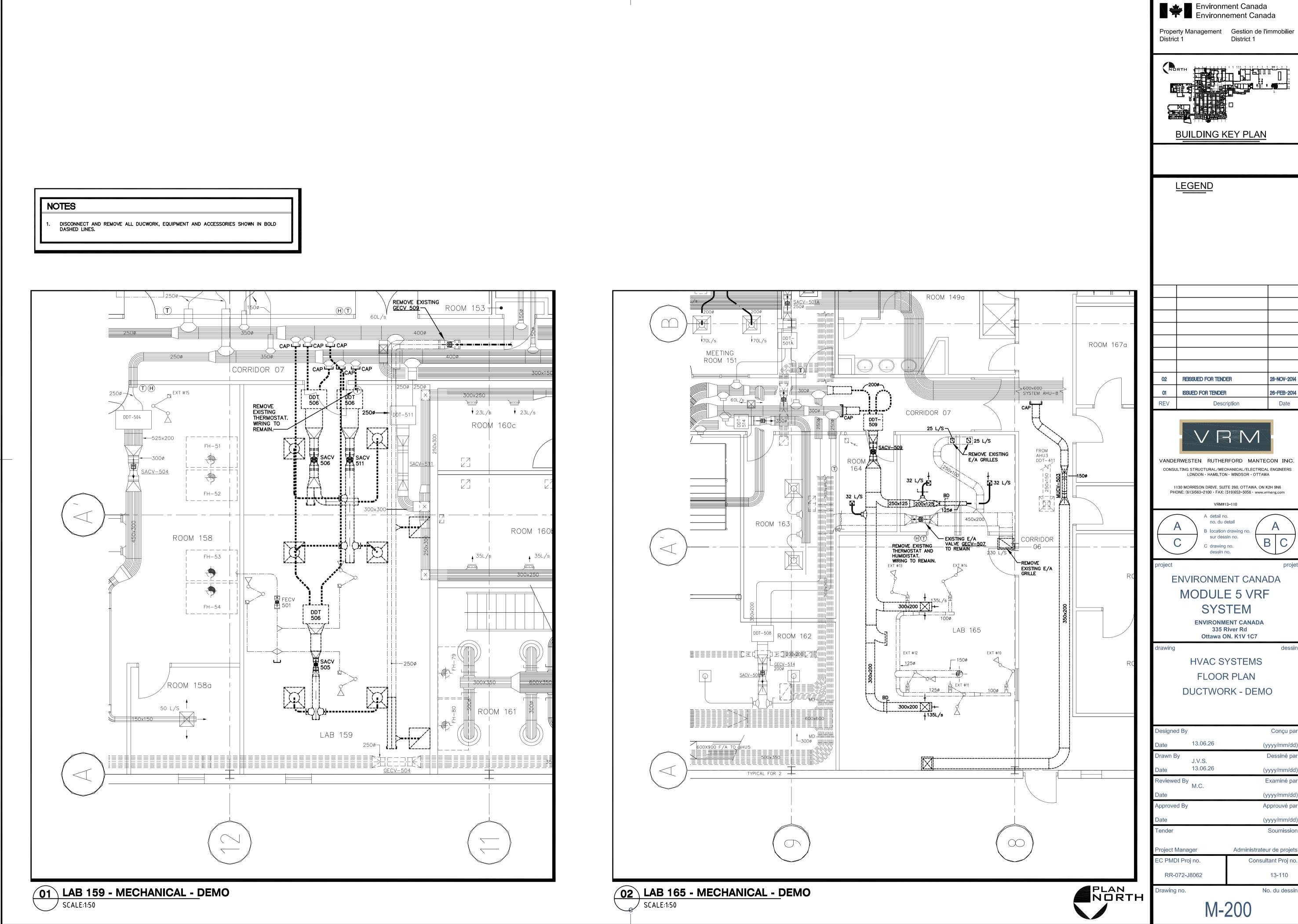
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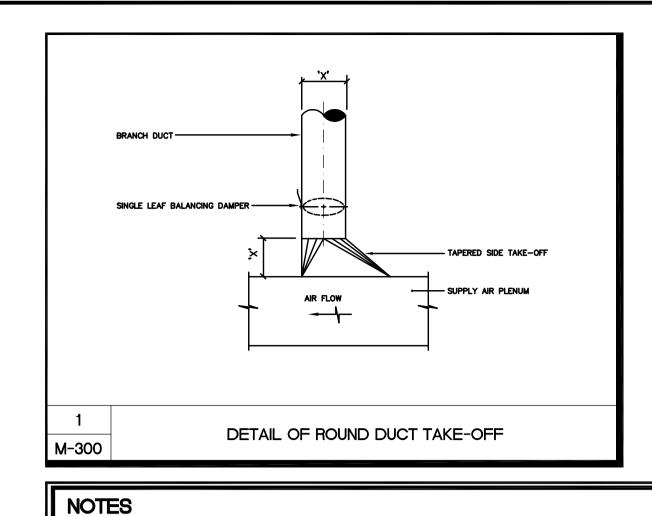
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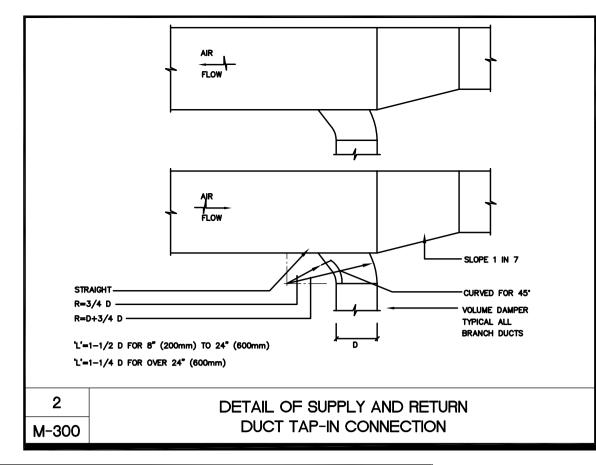


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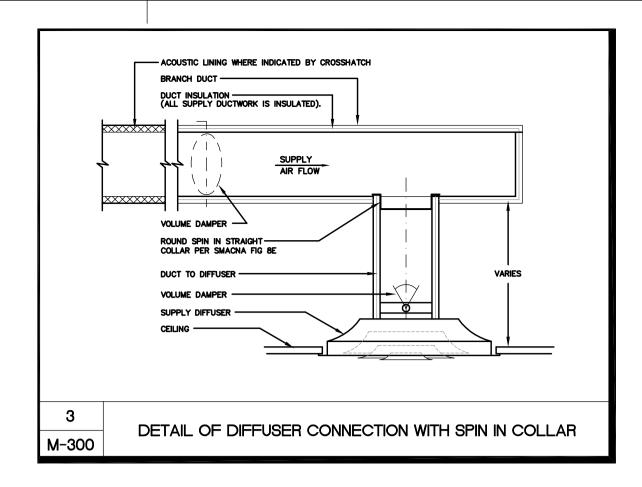
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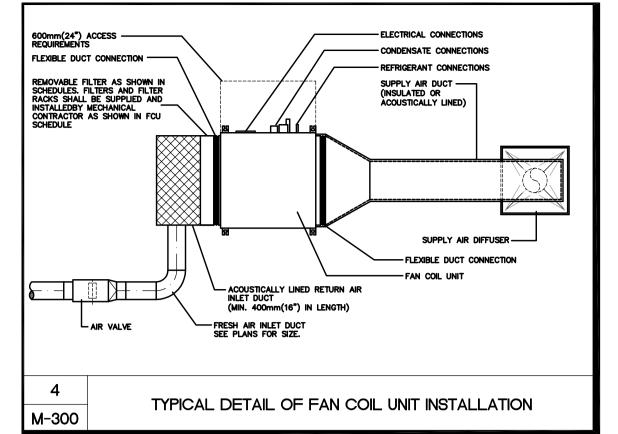


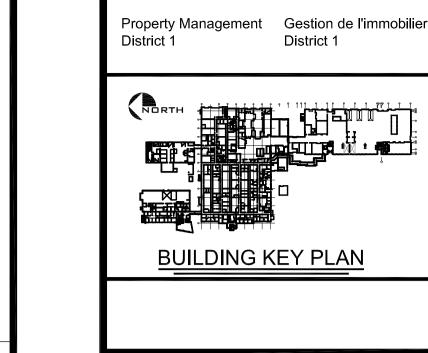
ADD NEW ROUTER BY AIR SAMPLING CONTRACTOR (AIRGENUITY), WIRE THE ROUTER TO THE SENSOR SUITE, INSTALL NEW TUBING FROM SENSOR SUITE TO LABS (1 TUBE TO LAB 159



CONNECT NEW CAV TO EXISTING SNORKEL EXHAUST.







Environment Canada

Environnement Canada

LEGEND



VANDERWESTEN RUTHERFORD MANTECON INC CONSULTING STRUCTURAL/MECHANICAL/ELECTRICAL ENGINEERS LONDON · HAMILTON · WINDSOR · OTTAWA

1130 MORRISON DRIVE, SUITE 260, OTTAWA, ON K2H 9N6

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ENVIRONMENT CANADA MODULE 5 VRF

> SYSTEM ENVIRONMENT CANADA 335 River Rd Ottawa ON. K1V 1C7

HVAC SYSTEMS FLOOR PLAN AND **DETAILS - DUCTWORK**

NEW

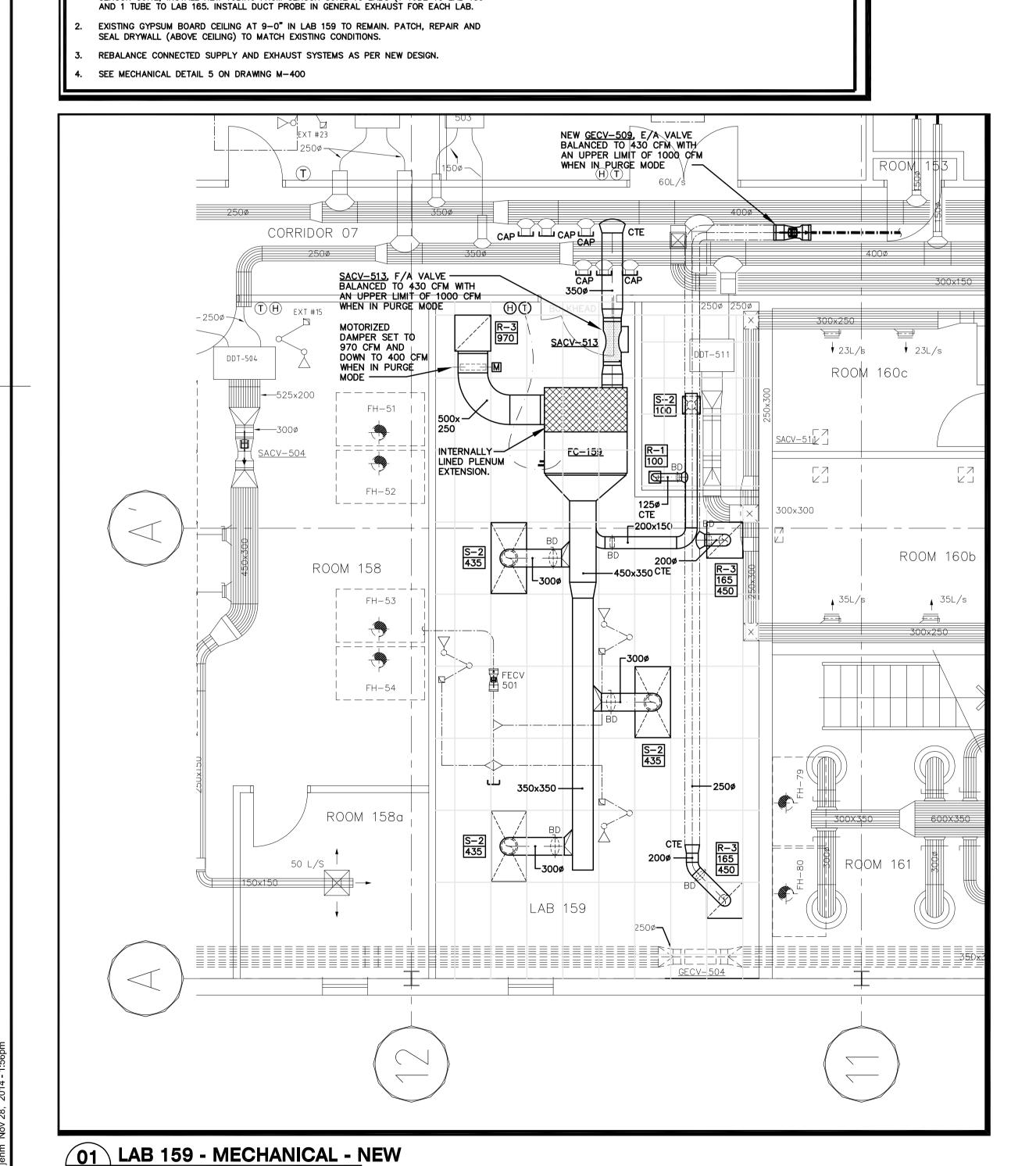
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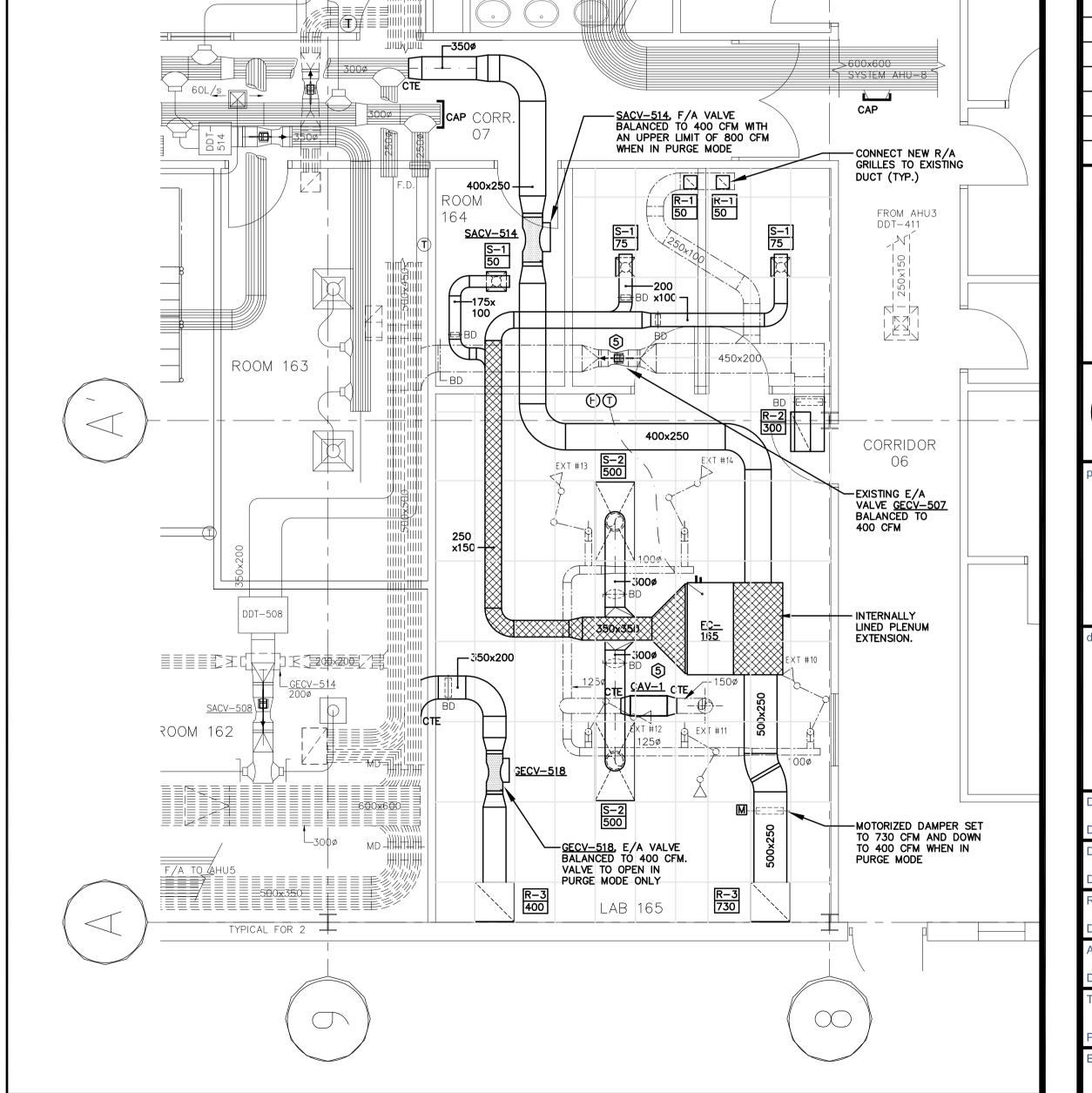
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PLAN NORTH

Orawing no.



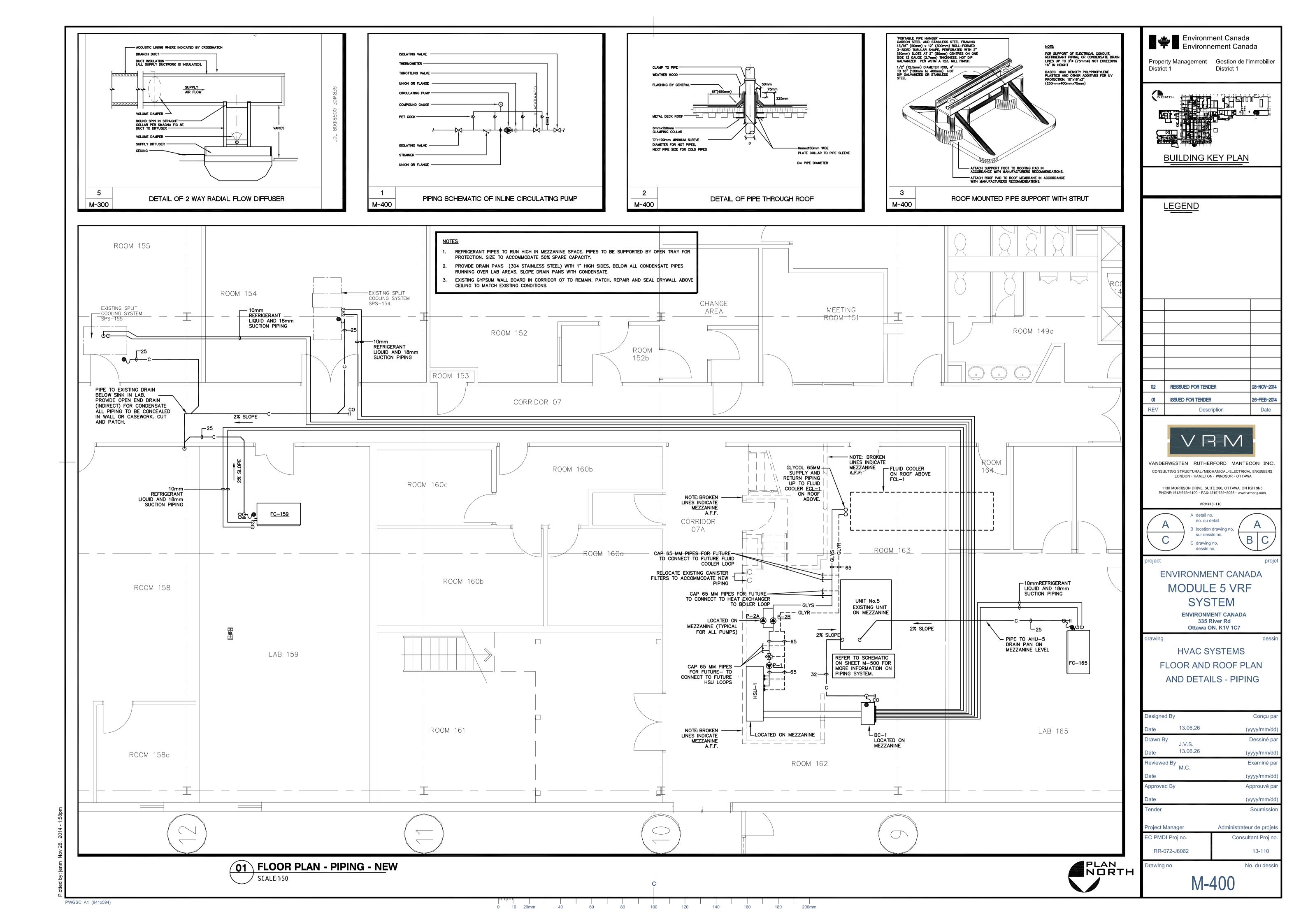


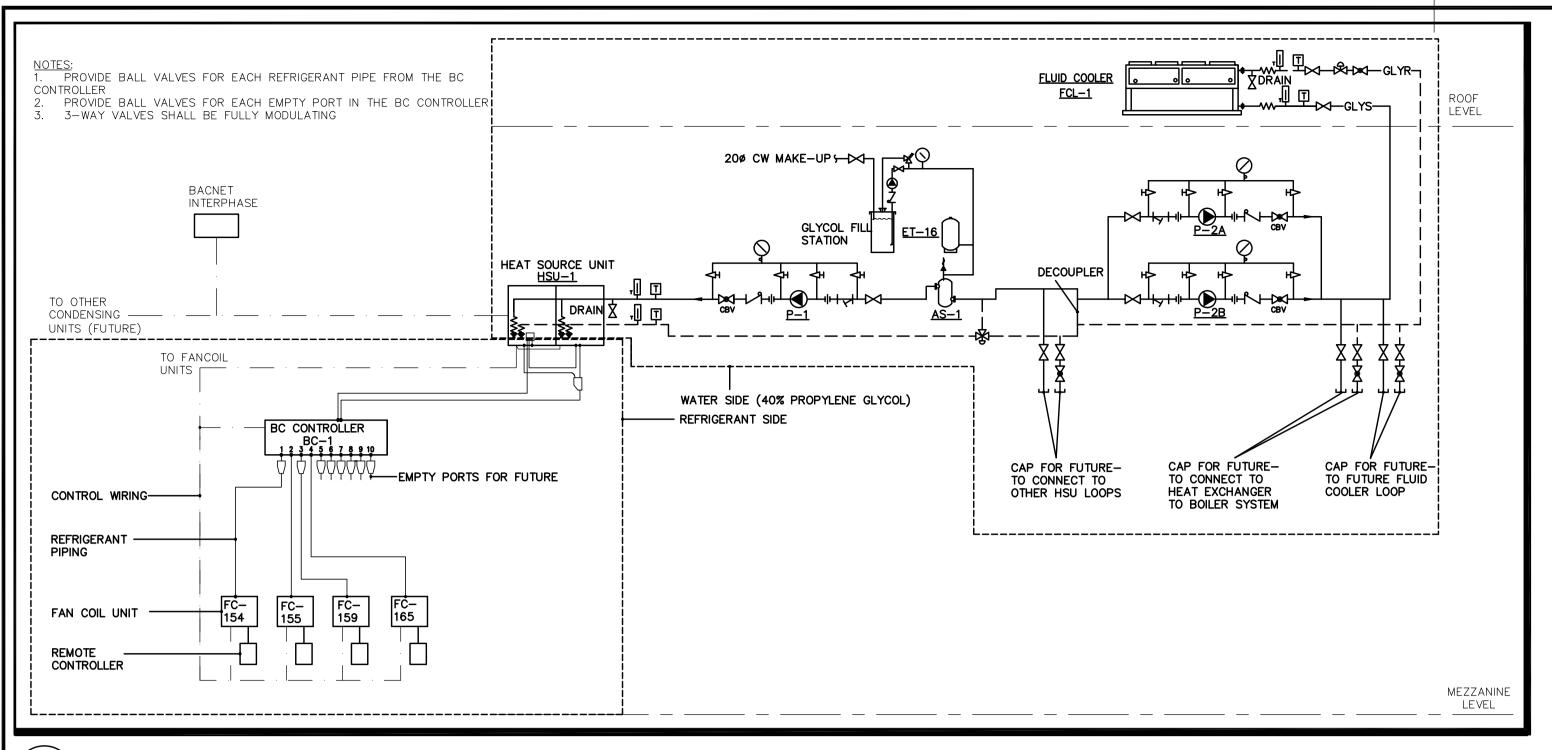
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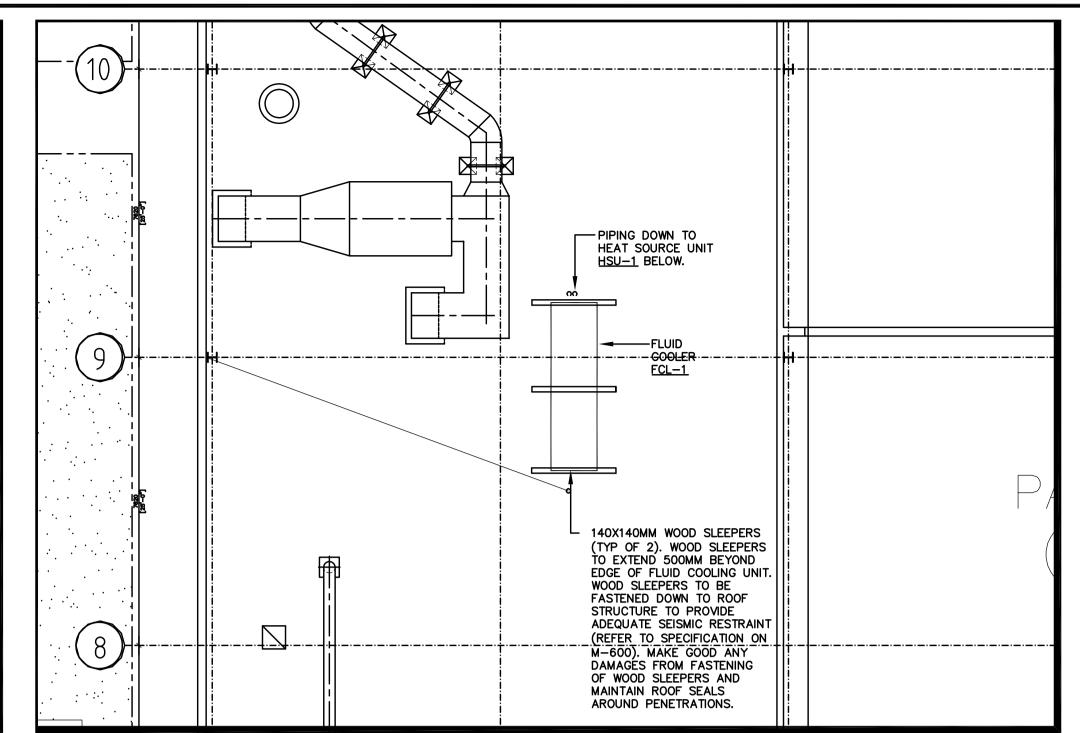
02 LAB 165 - MECHANICAL - NEW

PWGSC A1 (841x594)

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01 PIPING SCHEMATIC

SCALE: N/A

LAB HVAC OPERATIONS							
LAB 159		ROOM			***************************************	SNORKEL	GENERAL
MODE	AREA	HEIGHT	ACH	AIRFLOW	OFFSET	EXHAUST	EXHAUST
	FT2 (M2)	FT (M)		CFM (L/S)	CFM (L/S)	CFM (L/S)	CFM (L/S)
SETBACK	600 (55.8)	8.3 (2.54)	2	170 (79)	200 (94)	0 (0)	380 (173)
SNORKEL EXHAUST ON	600 (55.8)	8.3 (2.54)	2	170 (79)	200 (94)	225 (106)	142 (67)
PURGE	600 (55.8)	8.3 (2.54)	15	1250 (590)	200 (94)	0 (0)	1450 (683)
LAB 165		ROOM				SNORKEL	GENERAL
MODE	AREA	HEIGHT	ACH	AIRFLOW	OFFSET	EXHAUST	EXHAUST
	FT2 (M2)	FT (M)		CFM (L/S)	CFM (L/S)	CFM (L/S)	CFM (L/S)
SETBACK	520 (48.3)	8.3 (2.54)	2	145 (68)	200 (94)	0 (0)	345 (162)
SNORKEL EXHAUST ON	520 (48.3)	8.3 (2.54)	2.4	175 (82)	200 (94)	375 (177)	0 (0)
PURGE	520 (48.3)	8.3 (2.54)	15	1100 (510)	200 (94)	0 (0)	1300 (605)
NOTES	1. LAB 159 AND LAB	165 SHALL BE CON	NECTED TO THE E	XISTING AIRCUITY	SYSTEM	•	•

AIR VALVE SCHEDULE				
DESIGNATION	SACV-513	SACV- 514	GECV- 509	GECV- 518
ROOM SERVED / USE	159 / SUPPLY	165 / SUPPLY	159 / GENERAL EXHAUST	159 / GENERAL EXHAUST
MINIMUM AIRFLOW: CFM, (L/S)	0 (0)	0 (0)	0 (0)	0 (0)
MAXIMUM AIRFLOW: CFM, (L/S)	1200 (565)	1200 (565)	1200 (565)	900 (428)
PRESSURE DROP: IN.WG, (PA)	0.3 (75)	0.3 (75)	0.3 (75)	0.3 (75)
VALVE SIZE, IN (MM)	12"Ø (300 MM)	12"Ø (300 MM)	12"Ø (300 MM)	10"Ø (250 MM)
BASIS OF DESIGN:	PHOENIX MODEL MAVA112M-AMEHZ-PSL	PHOENIX MODEL MAVA112M-AMEHZ-PSL	PHOENIX MODEL EXVA112M-AMEHZ-PSL	PHOENIX MODEL EXVA110M-AMEHZ-PSL
DISCHARGE SOUND PERFORMANCE				
125	62	63	60	60
250	58	59	55	55
500	55	55	53	53
1000	60	60	57	57
2000	55	54	52	52
4000	54	53	52	52
NOTES	1. CONTRACTOR TO CONFIRM	ORIENTATION PRIOR TO ORDER	ING	•

FLUID COOLER SCHEDULE			
FCL-1			
ROOF			
HSU-1			
50% PROPYLENE GLYCOL			
212 (62)			
47 (3.0)			
19.4 (57.9)			
115 (46)			
104 (40)			
95 (35)			
2 @ 2 HP (1.5KW)			
575/3/60			
6.1			
1140			
SUPER LOW SOUND FAN VIBRATION SWITCH 2 FANS (2-SPEED EACH)			
1137 (520)			
REFPLUS FND124C-8-F19			

PUMP SCHEDULE			
DESCRIPTION	P-1	P-2A	P-2B
SERVICE:	HEAT SOURCE UNIT (HSU-1) PUMP	FLUID COOLER	FLUID COOLER
FLUID:	50% PROPYLENE GLYCOL	50% PROPYLENE GLYCOL	50% PROPYLENE GLYCOL
FLUID FLOW RATE: USGPM (L/S)	50 (3.2)	50 (3.2)	50 (3.2)
HEAD: FT.H20 (KPA)	30 (90)	40 (119)	40 (119)
PUMP SPEED: (RPM)	3,330	3,380	3,380
MOTOR SIZE: HP (KW)	1.09 (0.81)	1.40 (1.04)	1.40 (1.04)
ELECTRICAL CHARACTERISTICS: (V/PH/HZ)	230/3/60	230/3/60	230/3/60
PUMP TYPE:	CENTRIFUGAL INLINE, CLOSE COUPLED	CENTRIFUGAL INLINE, CLOSE COUPLED	CENTRIFUGAL INLINE, CLOSE COUPLED
ARRANGEMENT:	-	STANDBY/DUTY	STANDBY/DUTY
CONTROLS:	CONSTANT SPEED	CONSTANT SPEED	CONSTANT SPEED
MODEL REFERENCE:	WILO TOPS S 1.5x40	WILO TOPS S 1.5x50	WILO TOPS S 1.5x50

	DESCRIPTION	FC-154 (BY OTHERS)	FC-155 (BY OTHERS)	FC-159	FC-165
FAN	MAX AIRFLOW: CFM (L/S)	885 (471)	671 (417)	1412 (665)	1165 (550)
	EXT. STATIC PRESSURE: IN.WG (PA)	0.2 (50)	0.2 (50)	0.6 (150)	0.6 (150)
	SOUND PRESS. LEVEL (LOW-MID-HI)- dBA	26-28-29	26-28-29	35-40-44	32-37-41
AT	TOTAL CAPACITY: MBH, (KW)	34 (10)	27 (7.9)	54 (15.8)	40 (11.7)
HEAT	ENTERING AIR TEMP: °F (°C)	70 (21.1)	70 (21.1)	70 (21.1)	70 (21.1)
	TOTAL CAPACITY: MBH (KW)	30 (8.8)	24 (7.0)	48 (14.1)	36 (10.5)
T000	SENSIBLE CAPACITY: MBH (KW)	24 (7)	18 (5.3)		
0	ENTERING AIR TEMP: °F (°C)	70 (21.1)	70 (21.1)	70 (21.1)	70 (21.1)
	FILTER RATING: MERV RATING			13	13
	FILTER PRESSURE DROP: FT.H2O (KPA)			0.150	0.150
	POWER: KW			0.34	0.24
ELEC.	VOLTAGE: V/PH/HZ	208/1/60	208/1/60	208/1/60	208/1/60
ш	DRIVE TYPE	DIRECT, ECM MOTOR	DIRECT, ECM MOTOR	DIRECT, ECM MOTOR	DIRECT, ECM MOTOR
	MODEL REFERENCE: (MITSUBISHI)	PEFY-P30NMHU-E	PEFY-P24NMHU-E	PEFY-P48NMAU-E	PEFY-P36NMAU-E
	1. COOLING AND HEATING CONDITIONS BASED ON	INDOOR: (70F) DBT & (54F) WBT			
	2. FEATURES: 25%-100% CAPACITY CONTROL, CO	NDENSATE PUMP, ELECTRONIC EXPANS	ION VALVE, R410A REFRIGERANT,		
	3. MODELS INDICATED ARE BASED ON MITSUBISH	CITY MULTI SYSTEM.			
	4. UNIT AIRFLOW TO BE SET AS SHOWN ON DRAW	NGS			

02 ROOF PLAN - PIPING - NEW

SCALE:1:100

DESIGNATION	R-1	R-2	R-3
MOUNTING:	CEILING T-BAR	CEILING T-BAR	CEILING T-BAR
OUTLET TYPE:	REGISTER	REGISTER	REGISTER
NOMINAL FACE SIZE: IN (MM)	12x12 (300x300)	12x24 (300x600)	24x24 (600x600)
AIRFLOW RANGE: CFM (L/S)	300 (141)	1000 (471)	2000 (942)
MAXIMUM NOISE CRITERIA:	NC 30	NC 30	NC 30
E. H. PRICE MODEL REFERENCE:	80 DAL	80 DAL	80 DAL

6. FC-154 AND FC-155 ARE SUPPLIED AND INSTALLED BY OTHERS. NEW VRF SYSTEM TO CONNECT TO EXISTING FC-154 AND FC-155.

SUPPLY AIR OUTLET SCHEDULE				
DESIGNATION	\$1	\$2		
FLOW CHARACTERISTIC:	ASPIRATED	RADIAL FLOW		
MOUNTING:	CEILING T-BAR	CEILING T-BAR		
OUTLET TYPE:	DIFFUSER	DIFFUSER		
NOMINAL FACE SIZE: IN (MM)	12x12 (300x300)	48x24 (1200x600)		
CONNECTION SIZE: IN (MM)	4 (100)	12 (300)		
AIRFLOW RANGE: CFM (L/S)	105(50)	700 (330)		
MAXIMUM NOISE CRITERIA:	NC 25	NC 25		
MATERIAL	ALUMINUM	ALUMINUM		
ACCESSORIES:				
MODEL REFERENCE	PRICE- ASPD	PRICE- RFD		

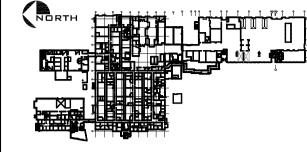
TERMINAL UNIT SCHEDULE				
CHARACTERISTIC	UNITS	CAV-1		
TYPE / MODEL REFERENCE	-	PRES. INDEP. PRICE SDV		
AIR INLET SIZE	MM (IN)	125 (5)		
MAX AIRFLOW	L/S (CFM)	94 (200)		
MIN. AIR STATIC PRESSURE	PA (IN.WG)	2.5 (0.01)		
ELECTRICAL	V/PH/HZ	240/1/60		
REMARKS	C -	CONST. VOLUME		

DESCRIPTION	HSU-1	
COOLING CAPACITY, MBH (KW)	168 (49.2)	
POWER INPUT, KW	10.67	
HEATING CAPACITY, MBH (KW)	188 (55.0)	
POWER INPUT, KW	10.19	
NET WEIGHT, LBS (KG)	808 (366)	
COMMPRESSER TYPE	INVERTER SCROLL HERMET	
COMPRESSOR STARTING METHOD	INVERTER	
SOUND PRESSURE LEVEL: dBa	50.0	
WATER FLOW RATE, L/MIN (GPM)	192 (50.8)	
PRESSURE DROP, FT.H20 (KPA)	6.0 (17.9)	
DIMENSIONS: (MM) H X W X D	2 @ 1100 x 880 x 550	
ELECTRICAL: V/PH/HZ	575/3/60	
ELECTRICAL: MCA	1 @ 11A & 1 @9A	
REFRIGERANT TYPE:	R410A	
MODEL REFERENCE: (MITSUBISHI)	PQRY-P168ZSKMU-A	
1. Cooling conditions based on Indoor: 80OF (26.7OC) DBT & 67OF (19.4OC) WBT; Water: 85OF (29.4OC)		
2. Heating conditions based on Indoor:	700F (21.10C); Water: 700F (21.10C)	
Models indicated are based on Mitsubishi City Multi System with R410A refriger		

BRANCH CONTROLLER SCHEDULE			
	DESCRIPTION	BC-1	
	NUMBER OF BRANCHES	10	
	COOLING POWER INPUT, KW	0.138	
	HEATING POWER INPUT, KW	0.066	
	ELECTRICAL: V/PH/HZ	208/1/60	
NET WEIGHT, LBS (KGS) 13		132 (59)	
	ACCESSORIES	DRAIN CONNECTION WITH FLEXIBLE HOSE AND INSULATION C/W CONDENSATE PUMP	
	MODEL REFERENCE	CMB-P1010NU-GA	

Environment Canada Environnement Canada

Property Management Gestion de l'immobilier
District 1 District 1



BUILDING KEY PLAN

<u>LEGEND</u>

02 REISSUED FOR TENDER 28-NOV-2014
01 ISSUED FOR TENDER 26-FEB-2014
REV Description Date



CONSULTING STRUCTURAL/MECHANICAL/ELECTRICAL ENGINEERS
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1130 MORRISON DRIVE, SUITE 260, OTTAWA, ON K2H 9N6

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AC

no. du detail

B location drawing no sur dessin no.

C drawing no.

ENVIRONMENT CANADA

MODULE 5 VRF SYSTEM

> ENVIRONMENT CANADA 335 River Rd Ottawa ON. K1V 1C7

EQUIPMENT
SCHEDULES AND
SCHEMATICS

Designed By		Conçu par
Date		(yyyy/mm/dd)
Drawn By	J.V.S.	Dessiné par
Date	13.06.26	(yyyy/mm/dd)
Reviewed By	M.C.	Examiné par
Date	13.06.26	(yyyy/mm/dd)
Approved By		Approuvé par
Date		(yyyy/mm/dd)
Tender		Soumission

Project Manager Administrateur de projets

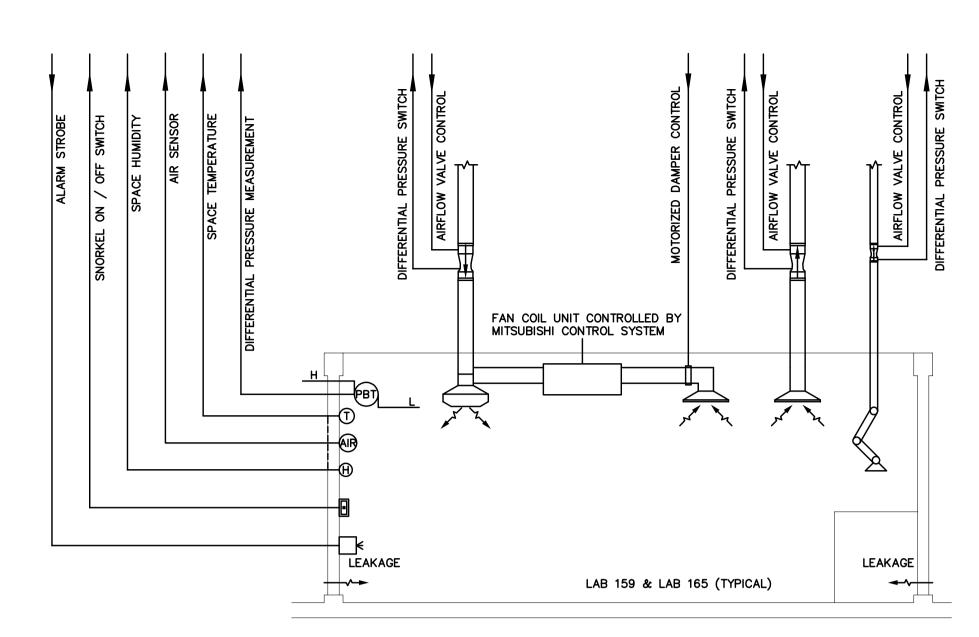
EC PMDI Proj no.

Consultant Proj no.

RR-072-J8062 13-110

Drawing no. No. du dessin

M-500



NOTES

1. FAN COIL UNIT CONTROLLED BY MITSUBISHI CONTROL SYSTEM. MITSUBISHI CONTROL SYSTEM TO BE PROVIDED WITH BACNET INTERPHASE WITH CAPABILITIES TO ADD

- 2. PHOENIX VALVES TO BE TIED INTO PHOENIX CONTROL SYSTEM (WHICH IS CONNECTED BY BACNET INTERFACE)
- 3. CONTROLS SHALL PICK UP 1 AIRCUITY POINT FOR EACH LAB.

01 ROOM SCHEMATIC SCALE: N/A

SEQUENCE OF OPERATION

- 1. SYSTEM COMPONENTS: THE SYSTEM CONSISTS OF THE FOLLOWING:
 - FLUID COOLER
 - PUMPS P-1, P-2A AND P-2B HEAT SOURCE UNIT
- 2. HYDRONIC LOOP OPERATION: WHEN HEAT SOURCE UNIT IS ENABLED, PUMP P-1 WILL START. WHEN THE WATER TEMPERATURE EXCEEDS 110°F (ADJ.) IN THE PRIMARY HEAT SOURCE UNIT LOOP OR DROPS BELOW 50 F (ADJ.), THE FLUID COOLER & P-2A WILL BE ENABLED AND THE 3-WAY VALVE SHALL MODULATE. THE FLUID COOLER SHALL OPERATE IN 6 STAGES (THREE FANS WITH TWO SPEEDS EACH) BASED UPON LEAVING FLUID COOLER TEMPERATURE. P-2B WILL BE ENABLED WHEN REQUIRED WHEN TEMPERATURE SETPOINT IS NOT MET WITH P-2A ONLY RUNNING. THE MINIMUM RUNTIMES AND USER DEFINABLE (ADJ.) DELAYS FOR EACH PIECE OF EQUIPMENT ON START AND STOP APPROPRIATELY SET TO ALLOW FOR ORDERLY SYSTEM START-UP, SHUTDOWN AND SEQUENCING. ON SHUT DOWN OR WHEN THE FLUID COOLER IS NO LONGER NEEDED, THE FLUID COOLER AND PUMPS SHALL STOP.
- 3. MONITORING: THE FOLLOWING SHALL BE MONITORED:
 - HEAT SOURCE UNIT SUPPLY AND RETURN WATER TEMPERATURES FLUID COOLER SUPPLY AND RETURN WATER TEMPERATURES
 - HEAT SOURCE UNIT OPERATING CONDITIONS, STATUSES AND ALARMS
- FLUID COOLER OPERATING CONDITIONS, STATUSES AND ALARMS .5 STATUS OF ALL PUMPS FROM CURRENT SENSING RELAYS

4. ALARMS: ALARMS SHALL BE PROVIDED AS FOLLOWS:

- FAILURE: COMMANDED ON, BUT THE STATUS IS OFF RUNTIME EXCEEDED: STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT
- LEAD PUMP FAILURE: LEAD PUMP IS IN FAILURE AND THE LAG PUMP IS ON.
- .2 FLUID COOLERS
 - FAILURE: COMMANDED ON, BUT THE STATUS IS OFF
 - HIGH /LOW HEAT SOURCE UNIT RETURN TEMP: TEMPERATURE GREATER THAN 115 F (ADJ.) / LESS THAN 45 F (ADJ.).
- 5. SHUTDOWN: SYSTEM SHUTS DOWN UNDER THE FOLLOWING CONDITIONS: .1 EMERGENCY SHUTDOWN SIGNAL
- 6. VRF SYSTEM: THE VRF CONTROL SYSTEM WILL BE SUPPLIED WITH INDEPENDENT CONTROLS (MITSUBISHI M-NET SYSTEM) THAT WILL CONNECT TO THE BAS VIA A BACNET INTERACE. THE VRF CONTROL SYSTEM WILL TIE IN AND COMMUNICATE WITH THE BMS SYSTEM. THE SYSTEM SHALL CYCLE ON/OFF TO MAINTAIN SPACE SET POINTS 21°C (ADJ.) IN THE UNOCCUPIED MODE. IN OCCUPIED MODE, SYSTEM SHALL RUN CONTINUOUSLY AND MODULATE HEATING AND COOLING CAPACITIES TO MEET SPACE HEATING AND COOLING DEMAND AS DETERMINED BY SPACE TEMPERATURE VARIATION FROM SET POINT OF 21°C (ADJ.). THE AHU AND PHOENIX VALVES SERVING THE SPACE ARE INTERLOCKED WITH THE VRF FAN COIL UNITS AND OPERATE TOGETHER.
- 7. FAN COIL UNITS: FAN COIL UNITS SHALL OPERATE BASED ON A ROOM SETPOINTS. UNITS PROVIDE HEATING AND COOLING AS REQUIRED TO MEET SPACE TEMPERATURE SET POINT. ON AN INCREASE IN SPACE TEMPERATURE, FAN SPEEDS UP AND REFRIGERANT VALVE MODULATES OPEN TO PROVIDE MORE COOLING. ON A DROP IN SPACE TEMPERATURE, HEATING IS ACTIVATED. ON FURTHER DROP IN TEMPERATURE, FAN SPEEDS UP AND REFRIGERANT VALVE MODULATES OPEN UP TO PROVIDE MORE HEATING. BC CONTROLLER MONITORS WHICH FAN COIL UNITS NEED HEATING AND COOLING AND SENDS HOT OR COLD REFRIGERANT ACCORDINGLY.
- 8. LAB OPERATION MODES:
- - THE ROOM SHALL START UP WHEN BOTH THE SUPPLY AND EXHAUST SYSTEMS ARE PROVEN STATUS. ALLOW FOR 2 MINUTES (ADJ.) BEFORE ENABLING THE PRESSURE ALARMS. THE SUPPLY AIRFLOW SHALL RAMP UP SIMULTANEOUSLY WITH THE SNORKEL EXHAUST AND GENERAL EXHAUST VALVÈS TÓ MAINTAIN THE DESIRED VOLUMETRIC OFFSET. THE FAN COIL UNIT SHALL OPERATE TO MAINTAIN ROOM SETPOINTS. THE HEAT SOURCE UNIT AND HYDRONIC SYSTEM WILL ACT ACCORDING TO THEIR SEQUENCES.
- STEADY STATE OPERATION:
 - THE SUPPLY SHALL TRACK THE TOTAL EXHAUST AND MAINTAIN THE VOLUMETRIC DIFFERENCE. THE ROOM SHALL SUPPLY AIR (FROM AHUS) SUPPLIED AT 2 ACH (ADJ.). THE FAN COIL UNIT WILL MAINTAIN ROOM SET POINTS.
 - .2 SNORKEL EXHAUST: THE SNORKEL EXHAUST SHALL BE TURN ON UPON ROOM STARTUP. THE GENERAL EXHAUST VALVE WILL MODULATE WITH THE SUPPLY VALVE TO MAINTAIN VOLUMETRIC AIRFLOW DIFFERENCE.
- SETBACK OPERATION: .1 SETBACK OPERATION IS SAME AS STEADY STATE (ADJ.)
- - UPON A SIGNAL FROM THE BAS, THE RETURN AIR DAMPER IN THE ROOM WILL CLOSE, THE GENERAL EXHAUST VALVE WILL RAMP UP TO 10 ACH IN THE LABORATORY. THE SNORKEL CAV WILL CONTINUE TO EXHAUST AT CONSTANT FLOW, AND THE SUPPLY VALVE WILL RAMP UP MAINTAINING THE VOLUMETRIC DIFFERENCE.
- .1 UPON A SIGNAL FROM AIRCUITY SYSTEM, THE SYSTEM WILL ENTER INTO PURGE OPERATION.

		POINTS LIST				
DEVICE#	ROOM#	DESCRIPTION	Al	DI	AO	DO
ST	159	SPACE TEMPERATURE	1			
SP	159	SPACE PRESSURE	1			
SH	159	SPACE HUMIDITY	1			
FC-RD	159	FAN COIL RETURN DAMPER				1
FC-RD	159	FAN COIL RETURN DAMPER		1		
AFVC-S	159	SUPPLY AIRFLOW VALVE CONTROL			1	
AFVS-S	159	SUPPLY AIRFLOW VALVE STATIC PRESSURE SWITCH		1		
AFVC-E	159	EXHAUST AIRFLOW VALVE CONTROL			1	
AFVS-E	159	EXHAUST AIRFLOW VALVE STATIC PRESSURE SWITCH		1		
AFVC-SN	159	SNORKEL AIRFLOW VALVE CONTROL			1	
AFVS-SN	159	SNORKEL AIRFLOW VALVE STATIC PRESSURE SWITCH		1		
ALM	159	ALARM STROBE				1
ST	165	SPACE TEMPERATURE	1			
SP	165	SPACE PRESSURE	1			
SH	165	SPACE HUMIDITY	1			
FC-RD	165	FAN COIL RETURN DAMPER				1
FC-RD	165	FAN COIL RETURN DAMPER		1		
AFVC-S	165	SUPPLY AIRFLOW VALVE CONTROL			1	
AFVS-S	165	SUPPLY AIRFLOW VALVE STATIC PRESSURE SWITCH		1		
AFVC-E	165	EXHAUST AIRFLOW VALVE CONTROL			1	
AFVS-E	165	EXHAUST AIRFLOW VALVE STATIC PRESSURE SWITCH		1		
AFVC-SN	165	SNORKEL CAV CONTROL			1	
AFVS-SN	165	SNORKEL CAV STATIC PRESSURE SWITCH		1		
ALM	165	ALARM STROBE				1
P-1	MEZANINE	HEAT SOURCE UNIT PUMP		1		
P-1	MEZANINE	HEAT SOURCE UNIT PUMP				1
P-2A	MEZANINE	FLUID COOLER PUMP (LEAD)		1		
P-2A	MEZANINE	FLUID COOLER PUMP (LEAD)				1
P-2B	MEZANINE	FLUID COOLER PUMP (LAG)		1		
P-2B	MEZANINE	FLUID COOLER PUMP (LAG)				1
FCL-1	ROOF	FLUID COOLER		1		
FCL-1	ROOF	FLUID COOLER				1
HSU-1-EWT	MEZANINE	HEAT SOURCE UNIT ENTERING WATER TEMP	1			
HSU-1-LWT	MEZANINE	HEAT SOURCE UNIT LEAVING WATER TEMP	1			
FCL-1-EWT	MEZANINE	FAN COIL UNIT ENTERING WATER TEMP	1			
FCL-1-LWT	MEZANINE	FAN COIL UNIT LEAVING WATER TEMP	1		1	

		Equipment				Controls			Responsibility		
о.	ltem	Char	acteristics	Location	Туре	Location	Manufact. Reference	Supplied by Div.	Installed By Div.	Wired & Connected by Div.	
	HEAT SOURCE UNIT HSU-1	MCA	1 @ 11 1 @ 9	MEZZANINE LEVEL	Disconnect	At Unit	See Spec	16	16	16	
1		Voltage	575		Variable Speed Drive	In Unit		15	15	16	
		Phases	3		Other Controls	At Unit		15	15	15	
		Freq.	60								
	BRANCH CONTROLLERS BC-1	KW	0.138	MEZZANINE LEVEL	Service Switch	At unit	See Spec	16	16	16	
		Voltage	208		Other Controls	See Dwgs.		15	15	15	
2		Phases	1								
		Freq.	60								
	Division 16 shall provide 1/2" co	nduit complete wit	th pullwire from Con	densing Unit HSU-1 to	BC-1 to fan coil units (d	laisy chain) for contr	ols connection by Divisio	n 15.			
		MCA	1 @ 3.41 1 @ 3.33	SEE DWGS	Starter	In Unit		15	15	16	
	FAN COIL UNITS	Voltage	208		Disconnect	At unit		15	15	16	
3	PAN COIL UNITS	Phases	1		Thermostat	See Dwgs.		15	15	16	
		Freq.	60		Other Controls	See Dwgs.		15	15	15	
	Division 16 shall provide outlet box & run 1/2" conduit complete with pullwire from box to unit for thermostat controls.										
	PUMP P-1	KW	0.81	MEZZANINE LEVEL	Disconnect	At unit	See Spec	16	16	16	
		Voltage	230		Starter	See Dwgs.		15	15	16	
1		Phases	3		Other Controls	See Dwgs.		15	15	15	
		Freq.	60								
	PUMP P-2A	KW	1.04	MEZZANINE LEVEL	Disconnect	At unit	See Spec	16	16	16	
		Voltage	230		Starter	See Dwgs.		15	15	16	
5		Phases	3		Other Controls	See Dwgs.		15	15	15	
		Freq.	60								
	PUMP P-2B	KW	1.04	MEZZANINE LEVEL	Disconnect	At unit	See Spec	16	16	16	
		Voltage	230		Starter	See Dwgs.		15	15	16	
5		Phases	3		Other Controls	See Dwgs.		15	15	15	
		Freq.	60								
	FLUID COOLER FCL-1	МСА	6.10	ROOF LEVEL	Disconnect (WP)	At unit	See Spec	16	16	16	
		Voltage	575		Starter			15	15	16	
6		Phases	3		Other Controls	See Dwgs.		15	15	15	
		Freq.	60								
	GLYCOL FILL STATION (AXIOM MODEL SF100)	MCA	0.70	MEZZANINE LEVEL	Disconnect	Plug		15	15	16	
		Voltage	120				1				
•		Phases	1				1				
		Freq.	60								
ISIC	L DN 15: REFERS TO MECHANICA	 .L	1	1	1	1	-	1	1		



PWGSC A1 (841x594)

M-600

MECHANICAL SPECIFICATIONS

ABBREVIATED SPECIFICATION DESCRIBES SOME EQUIPMENT AND MATERIALS TO BE INCLUDED IN THE WORK. ONLY FIRST CLASS WORKMANSHIP, MATERIALS AND PRACTICES WILL BE ACCEPTED. THE STANDARDS TO BE MET ARE FULLY DESCRIBED IN THE MASTER SPECIFICATIONS OF VANDERWESTEN RUTHERFORD MANTECON INC. AND ARE AVAILABLE FOR REFERENCE AT THEIR MAIN OFFICE.

GENERAL CONDITIONS

- A. CONFORM TO ONTARIO BUILDING CODE INCLUDING PART 7 PLUMBING AND AMENDING REGULATIONS.
- B. CONFORM TO ONTARIO FIRE CODE.
- C. CONFORM TO LOCAL AND DISTRICT BYLAWS, REGULATIONS AND PUBLISHED ENGINEERING STANDARDS.

SCOPE OF WORK

A. THE REMOVAL OR RELOCATION OF EXISTING, AND THE SUPPLY AND INSTALLATION OF NEW EQUIPMENT, DUCTWORK AND PIPING AS SHOWN ON THE DRAWINGS AND AS NOTED.

B. GENERAL

- a. COMPLY WITH GENERAL CONDITIONS.
- b. PROVIDE ELECTRONIC COPIES OF SHOP DRAWINGS OF ALL MAJOR EQUIPMENT FOR APPROVAL.
- c. BALANCE ALL AIR SYSTEMS AND SUBMIT BALANCING REPORT ON COMPLETION.
- d. SUBMIT OPERATION AND MAINTENANCE INSTRUCTION MANUALS. e. ON COMPLETION OF PROJECT AND BEFORE FINAL PAYMENT,
- SUBMIT TWO (2) SETS OF AUTOCAD, PDF AND HARDCOPY AS-BUILT DRAWINGS SHOWING ALL CHANGES AND CONCEALED SERVICES DIMENSIONED WITH EXACT LOCATIONS NOTED
- f. PROVIDE WRITTEN GUARANTEE FOR ALL NEW EQUIPMENT AND WORKMANSHIP FOR ONE YEAR FROM DATE OF ACCEPTANCE. FIVE (5) YEARS FOR COMPRESSOR AND HEAT EXCHANGER. DEFECTIVE PARTS REPAIRED OR REPLACED WITHOUT CHARGE.
- g. IF ASBESTOS MATERIAL IS ENCOUNTERED, STOP WORK IN THE AFFECTED AREA AND IMMEDIATELY NOTIFY THE CONSULTANT.
- h. EQUIPMENT MANUFACTURERS SHALL PROVIDE ON SITE TRAINING AND SHALL PARTICIPATE IN START-UP WHERE REQUIRED.

A. THIS CONTRACTOR SHALL ASSUME FULL RESPONSIBILITY FOR LAYING OUT HIS WORK AND ANY DAMAGE OR EXTRA COSTS CAUSED TO THE OWNER OR OTHER CONTRACTORS BY IMPROPER LOCATION OR CARRYING OUT HIS WORK. CARRY ALL NECESSARY INSURANCE

CERTIFICATES, FEES, ETC.

A. GIVE ALL NOTICES, OBTAIN ALL PERMITS AND PAY ALL FEES SO THAT THE WORK SPECIFIED HEREIN MAY BE CARRIED OUT. AT THE ENGINEER'S REQUEST. FURNISH ANY CERTIFICATES AS EVIDENCE THAT THE WORK INSTALLED CONFORMS TO THE LAWS AND REGULATIONS OF ALL AUTHORITIES HAVING JURISDICTION.

CEILING TILE REMOVAL / REPLACEMENT

A. EACH RESPECTIVE SUB-TRADE OR PRIME MECHANICAL CONTRACTOR AS THE CASE MAY BE SHALL BE RESPONSIBLE FOR THE REMOVAL AND REINSTALLATION OF ANY CEILING TILES TO SUIT WORK WITHIN THE CEILING SPACE. ANY DAMAGED TILES SHALL BE REPLACED AT THE COST TO THE RESPECTIVE SUB-TRADE OR PRIME MECHANICAL CONTRACTOR AND SHALL BE HELD BACK ON THE PROGRESS DRAW.

TESTING AND BALANCING

- A. BALANCE ALL SYSTEMS WHERE AIRFLOW IS GIVEN FOR RATED AIR FLOW, ROOM TEMPERATURE CONTROL AND CHECK CURRENT DRAW AFTER INSTALLATION IS COMPLETE AND IN FULL WORKING ORDER. ADJUST CONTROL DAMPERS, AND DIFFUSERS FOR PROPER AIR CIRCULATION AND MINIMUM ENERGY CONSUMPTION. ADJUST FAN SPEEDS AS REQUIRED TO OBTAIN SPECIFIC PERFORMANCE. BALANCE AIR VALVES TO THEIR MAXIMUM AND MINIMUM POSITIONS. BALANCE
- MECHANICAL SYSTEMS SHALL NOT BE CONSIDERED READY FOR FINAL INSPECTION UNTIL BALANCING RESULTS ACCEPTABLE TO THE ENGINEER ARE OBTAINED. IF IT IS FOUND THAT THE SPECIFIED AIR FLOWS OR FILLID FLOWS CANNOT RE ACHIEVED ON PORTIONS OF THE SYSTEM. THE ACTUAL CONDITIONS SHALL BE REPORTED TO THE ENGINEER FOR CONSIDERATION OF CORRECTIVE ACTION BEFORE CONTINUING THE BALANCING PROCEDURE. PROVIDE INSTRUMENTS AND MANPOWER TO VERIFY RESULTS OF UP TO 30% OF ALL REPORTED MEASUREMENTS. IF MEASURED FLOW AT FINAL INSPECTION SHOWS A DEVIATION OF 10% OR MORE OF SELECTED AREAS. THE REPORT SHALL BE REJECTED. IF REPORT IS REJECTED. SYSTEMS SHALL BE RE-BALANCED AND NEW CERTIFIED REPORT SUBMITTED AT NO EXTRA COST, FOLLOWING WHICH THE ENGINEER RESERVES THE RIGHT TO REQUEST ADDITIONAL VERIFICATION.
- C. SUBMIT WRITTEN BALANCING REPORT CONFORMING TO AABC AND ASHRAE STANDARDS FOR ENGINEER'S APPROVAL ONCE REVIEWED AND DEEMED SATISFACTORY BY THE ENGINEER, THE BALANCING CONTRACTOR SHALL SUBMIT 3 COPIES OF THE BALANCING REPORT FOR SUBMISSION TO THE OWNER.

HOURS OF WORK

- A. ANY AUDIBLE TESTING, CORE DRILLING OR ANY OTHER NOISY WORK MUST BE PERFORMED "AFTER HOURS". MAKE ARRANGEMENTS WITH BUILDING PERSONNEL TO CONFIRM TIMES FOR SUCH WORK.
- REFER TO ENVIRONMENT CANADA GENERAL CONDITIONS FOR HOURS OF WORK.

SEISMIC RESTRAINTS

- PROFESSIONAL ENGINEER HOLDING A CERTIFICATE OF AUTHORIZATION IN THE PROVINCE OF ONTARIO WITH A MINIMUM OF 5 YEARS EXPERIENCE IN SEISMIC DESIGN, AND A MINIMUM OF \$1 MILLION PROFESSIONAL LIABILITY INSURANCE INCLUDING ERRORS AND
- OMISSIONS INSURANCE. AT THE COMPLETION OF THE PROJECT, THE SEISMIC ENGINEER SHALL REVIEW THE INSTALLATIONS ON SITE, AND SHALL PREPARE A WRITTEN REPORT, WITH A LETTER SIGNED, SEALED AND DATED BY THE SEISMIC ENGINEER, CERTIFYING THAT THE INSTALLATIONS HAVE BEEN COMPLETED IN ACCORDANCE WITH THEIR DESIGN AND SHOP DRAWINGS.

SEISMIC CONTROL MEASURES

- A SINGLE SUPPLIER SHALL PROVIDE SEISMIC DESIGN, VIBRATION
- ISOLATION, AND SEISMIC RESTRAINT. SEISMIC RESTRAINTS ARE TO BE PROVIDED FOR ALL OPERATIONAL AND FUNCTIONAL COMPONENTS OF BUILDING SERVICES IN ACCORDANCE WITH CURRENT REQUIREMENTS OF THE ONTARIO
- BUILDING CODE CABLE RESTRAINT SYSTEMS, ROD STIFFENER CLAMPS AND SEISMIC ISOLATOR CAPACITIES SHALL BE VERIFIED BY AN INDEPENDENT TEST LABORATORY

MECHANICAL SPECIFICATIONS

SEISMIC CONTROL MEASURES CONT'D

- CONNECTION MATERIALS SHALL BE SELECTED BY AND SITE SPECIFIC DESIGNS TO BE PREPARED BY THE SEISMIC ENGINEER. THE SEISMIC ENGINEER MAY SELECT AND SPECIFY MATERIALS AND ANCHORS TO BE PROVIDED BY THE CONTRACTOR WHERE THIS IS APPROPRIATE.
- CONTRACTOR SHALL ENSURE THAT THE SEISMIC ENGINEERS' REQUIREMENTS AND SPECIFICATION ARE MET. SEISMIC RESTRAINT BASE MOUNTED EQUIPMENT: ALL BASE MOUNTED EQUIPMENT REQUIRES ATTACHMENTS AND SEISMIC RESTRAINT AS SPECIFIED BY THE SEISMIC
- SUSPENDED EQUIPMENT: ALL SUSPENDED EQUIPMENT REQUIRES SEISMIC RESTRAINT. ROOF MOUNTED EQUIPMENT SHALL BE INSTALLED ON A STRUCTURAL
- FRAME, SEISMIC RATED ROOF CURB, OR STRUCTURAL CURB OR FRAME MECHANICALLY CONNECTED TO THE STRUCTURE. ITEMS SHALL NOT BE MOUNTED ON SLEEPERS OR PADS THAT ARE NOT MECHANICALLY ATTACHED TO THE STRUCTURE
- ROOF MOUNTED PIPING AND DUCTWORK IS TO BE INSTALLED ON CURBS OR FRAMES MECHANICALLY CONNECTED TO THE BUILDING STRUCTURE. ROOF ANCHORS AND SEISMIC CABLES OR FRAMES SHALL BE USED TO RESIST SEISMIC AND WIND LOADING. WIND LOADING FORCES SHALL BE DETERMINED BY THE SEISMIC ENGINEER.

CONTROLS

- ALL CONTROLS SHALL BE BY DELTA CONTROLS (REGULVAR). LOCATE THERMOSTATS AS SHOWN ON THE DRAWINGS. AND VERIFY CONNECTION TO CORRECT TERMINAL UNITS AS SHOWN ON THE DRAWINGS. VERIFY PROPER CALIBRATION AND OPERATION OF ALL NEW AND EXISTING CONTROLS. IF FAULTY. ADVISE ENGINEER OF PROBLEM AND OBTAIN DIRECTIONS FOR REMEDIAL WORK.
- PROVIDE ALL REQUIRED CONTROL HARDWARE LOW VOLTAGE WIRING, AND OTHER DEVICES FOR PROPER CONTROL. INCLUDE ALL ASSOCIATED

10. VARIABLE REFRIGERANT FLOW SYSTEM

- WATER SOURCE HEAT RECOVERY UNITS: THE WR2-SERIES SHALL CONSIST OF THE PQRY-P-ZKMU CONDENSING UNIT, INDOOR UNITS, AND M-NET DDC (DIRECT DIGITAL CONTROLS). THE PQRY-P-ZKMU CONDENSING UNIT SHALL BE SPECIFICALLY USED WITH CITY MULTI VRF INDOOR AND CONTROL COMPONENTS. THE PQRY OUTDOOR UNITS SHALL BE EQUIPPED WITH MULTIPLE CIRCUIT BOARDS THAT INTERFACE TO THE M-NET CONTROLS SYSTEM AND SHALL PERFORM ALL FUNCTIONS NECESSARY FOR OPERATION. THE CONDENSING UNIT SHALL BE SUITABLE FOR INDOOR LOCATION. THE CONDENSING UNIT SHALL BE COMPLETELY FACTORY ASSEMBLED, PIPED AND WIRED. EACH UNIT SHALL BE THOROUGHLY RUN TESTED AT THE FACTORY WITHOUT EXCEPTION ALTERNATE PRODUCT OFFERINGS SHALL PROVIDE THE OWNER WITH WRITTEN CONFIRMATION AND RESULTS FOR THE FACTORY RUN TEST ON EACH UNIT. FACTORY MANUFACTURED TWINNING KITS WILL BE SUPPLIED LOOSE TO FACILITATE THE FIELD CONNECTION OF A MAXIMUM OF TWO (2) MODULAR CONDENSING UNITS PER SYSTEM. THE CMY-Q100 HIGH PRESSURE SIDE TWINNING KIT MUST BE INSTALLED EXTERNAL TO THE UNIT WHERE AS THE LOW PRESSURE SIDE CMY-R100BK TWINNING KITS IS INSTALLED IN THE MASTER UNIT. PLEASE REFERENCE INSTALLATION INSTRUCTIONS FOR
- THE UNIT SHALL BE A CEILING-CONCEALED DUCTED INDOOR FAN COIL DESIGN THAT MOUNTS ABOVE THE CEILING WITH A 2-POSITION, FIELD ADJUSTABLE RETURN AND A FIXED HORIZONTAL DISCHARGE SUPPLY AND SHALL HAVE A MODULATING LINEAR EXPANSION DEVICE. THE UNIT SHALL BE USED WITH THE HEATING/COOLING AND HEAT RECOVERY OUTDOOR UNIT. THE UNIT SHÁLL SUPPORT INDIVIDUAL CONTROL USING MANUFACTURER'S CONTROLLERS. THE FAN SPEED CAN BE MODULATED VIA A 3RD PARTY 0-10 V SIGNAL.THE INDOOR UNIT SHALL HAVE A DUCTED AIR OUTLET SYSTEM AND DUCTED RETURN AIR SYSTEM. A CONDENSATE PAN AND DRAIN SHALL BE PROVIDED UNDER THE COIL. THE CONDENSATE SHALL BE PUMPED (USING THE FAN COIL UNIT INTERNAL PUMP) VERTICALLY (AS RECOMMENDED BY MANUFACTURER) AND THEN GRAVITY DRAINED FROM THE FAN COIL. THIS UNIT SHALL USE CONTROLS PROVIDED BY THE MANUFACTURER TO PERFORM FUNCTIONS NECESSARY TO OPERATE THE SYSTEM.
- THE BC (BRANCH CIRCUIT) CONTROLLERS SHALL BE SPECIFICALLY USED WITH R410A SYSTEMS. THESE UNITS SHALL BE EQUIPPED WITH A CIRCUIT BOARD THAT INTERFACES TO THE CONTROLS SYSTEM AND SHALL PERFORM ALL FUNCTIONS NECESSARY FOR OPERATION. THE UNIT SHALL HAVE A GALVANIZED STEEL FINISH. THE BC CONTROLLER SHALL BE COMPLETELY FACTORY ASSEMBLED, PIPED AND WIRED. FACH UNIT SHALL BE RUN TESTED AT THE FACTORY. THIS UNIT SHALL BE MOUNTED INDOORS, WITH ACCESS AND SERVICE CLEARANCE PROVIDED FOR EACH CONTROLLER. THE SUM OF CONNECTED CAPACITY OF ALL INDOOR AIR HANDLERS SHALL RANGE FROM 50% TO 150% OF RATED CAPACITY. THE BC CONTROLLER SHALL BE CONSTRUCTED FROM GALVANIZED STEEL PLATE PARTIALLY INSULATED WITH POLYURETHANE FOAM, BC SHALL BE CONNECTED TO THE CONDENSING UNIT VIA A HIGH PRESSURE AND LOW PRESSURE PIPE. AN INTEGRAL CONDENSATE PAN AND DRAIN SHALL BE PROVIDED. THE REFRIGERATION PROCESS IN THE BC CONTROLLER SHALL BE MAINTAINED BY LEV'S (LINEAR EXPANSION VALVES) WHICH WILL BE CONTROLLED BY PRESSURE AND TEMPERATURE SENSORS.
- MITSUBISHI M-NET CONTROL SYSTEM AND COMPONENTS (INCLUDING BACNET INTERPHASE) SHALL BE SUPPLIED BY MITSUBISHI. THE CONTROLS NETWORK (CN) SHALL BE CAPABLE OF SUPPORTING REMOTE CONTROLLERS, SCHEDULE TIMERS, SYSTEM CONTROLLERS, CENTRALIZED CONTROLLERS, AN INTEGRATED WEB BASED INTERFACE, GRAPHICAL USER WORKSTATION, AND SYSTEM INTEGRATION TO BUILDING MANAGEMENT SYSTEMS VIA BACNET®, ALL REQUIRED CONTROLS EQUIPMENT SHALL BE SUPPLIED BY THE MANUFACTURER. BACNET INTERFACE: THE HVAC BACNET INTERFACE, SHALL SUPPORT UP TO FIFTY INDOOR UNITS WITH A VARIETY OF NETWORK VARIABLES ON A PER INDOOR UNIT BASIS. INPUT VARIABLES INCLUDE, BUT ARE NOT LIMITED TO, ON/OFF, OPERATION MODE, FAN SPEED, PROHIBIT REMOTE CONTROLLER, AND FILTER SIGN RESET. OUTPUT VARIABLES INCLUDE, BUT ARE NOT LIMITED TO, MODEL SIZE, ALARM STATE, ERROR CODE, AND ERROR ADDRESS.

ALL DUCTWORK TO BE FABRICATED FROM GALVANIZED STEEL TO CLEAR INSIDE DIMENSIONS AS NOTED ON THE DRAWINGS WITH ALL FLAT SURFACES CROSS BROKEN. ALL DUCTWORK TO BE FREE FROM LEAKS, IN ACCORDANCE WITH RECOMMENDATIONS OF ASHRAE AND SMACNA. ALL DUCTWORK IS TO BE FABRICATED COMPLETE WITH FLEXIBLE CONNECTIONS, TURNING VANES, VOLUME EXTRACTORS, APPROPRIATE MANUAL DAMPERS, TEST PORTS AND ACCESS PANELS AS REQUIRED AND AS INDICATED ON DRAWINGS.

DUCT CLEANING

- a. CLEAN ALL NEW AND RENOVATED DUCTWORK. CLEAN INTERIOR SURFACES OF ALL NEW DUCTWORK AND ACCESSORIES INSTALLED AS PART OF THIS PROJECT. VERIFY CLEANLINESS AND PROVIDE REPORT TO CONSULTANT WITH CERTIFICATE OF CLEANLINESS. INCLUDE PHOTOGRAPHIC RECORD OF CLEANED SURFACES AND
- COMPONENTS. GRILLES AND DIFFUSERS REFER TO SCHEDULE

MATCH T-BAR COLOUR, CONCEALED FASTENING

- a. E.H. PRICE MODELS AS INDICATED. EQUIVALENTS: TITUS, CARNES. b. SUPPLY DIFFUSERS (SQUARE): E.H. PRICE ASCD AND ASPDA ALUMINUM, ADJUSTABLE PATTERN, VOLUME DAMPERS, FRAME TO SUIT INVERTED T-BAR SUSPENSION, BAKED ENAMEL FINISH TO
- PERFORATED FACE AND VANES WITH AN ALUMINUM BACKPAN. THE ENTIRE UNIT IS FINISHED IN B12 WHITE POWDER COAT. d. CEILING RETURN GRILLES: E.H. PRICE 80 SERIES. ALUMINUM,
- CURVED FACE BORDER FOR SURFACE MOUNTING, OPEN GRID CORE VOLUME DAMPER, CONCEALED FASTENING, FINISH TO MATCH CEILING

c. RADIAL TYPE DIFFUSERS: E.H. PRICE RFDA. RFD IS AN ALUMINUM

e. CEILING EXHAUST GRILLES: SAME AS CEILING RETURN GRILLES.

MECHANICAL SPECIFICATIONS

C. DUCT INSULATION

- RIGID DUCT INSULATION SHALL BE FIBROUS GLASS WOOL. FIBERGLAS CANADA INC. VAPOUR-SEAL DUCT INSULATION AF530 WITH RFFRK FACING OR MANSON INSULATION INC. AK BOARD WITH FSK FACING.
- b. FLEXIBLE DUCT INSULATION SHALL BE FIBROUS GLASS WOOL. FIBERGLAS CANADA INC. TYPE 2/RFFRK FACING OR MANSON INSULATION INC. ALLEY WRAP/FSK FACING.
- c. APPLY INSULATION, WRAPPING, VAPOUR BARRIER, ADHESIVE AND COATINGS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS ONLY AFTER ALL REQUIRED TESTING IS COMPLETED AND APPROVALS ARE RECEIVED.
- d. WORK SHALL BE PERFORMED BY INSULATION JOURNEYMEN IN A WORKMAN LIKE MANNER TO PRESENT A NEAT APPEARANCE. e. DO NOT APPLY INSULATION OR FINISHING WHEN THE AMBIENT
- TEMPERATURE IN THE SPACE IS BELOW 10°C (50°F). f. SERVICE TYPE THICKNESS AIR SUPPLY RECTANGULAR RIGID 25 MM (1") AIR SUPPLY ROUND FLEXIBLE 25 MM (1") DUCTWORK UNHEATED ATTIC RIGID 75 MM (3")
- DUCT LINING a. LINE INTERNAL SURFACES OF ALL DUCTWORK SHOWN CROSS HATCHED WITH 1" THICK FIBREGLASS DUCT LINING, IMPALING LINING ON WELD PINS. SECURING WITH SPEED WASHERS. b. NO ALLOWANCE HAS BEEN MADE IN DUCT SIZES INDICATED FOR INTERNAL LINING. INCREASE DUCT SIZE 1" ALL AROUND WHERE LINING IS TO BE APPLIED.

13. MOTORIZED DAMPERS

- TAMCO SERIES 1500 ENHANCED AIR-FOIL DAMPER AS MANUFACTURED BY T. A. MORRISON & CO OR EQUIVALENT BY RUSKIN, NAILOR. EXTRUDED ALUMINUM (6063T5) DAMPER FRAME SHALL NOT BE LESS
- THAN .080" (2.03MM) IN THICKNESS. DAMPER FRAME TO BE 4" DEEP. BLADES TO BE EXTRUDED ALUMINUM (6063T5) PROFILES. ALUMINUM END CAPS ARE TO BE PRESS FITTED TO BLADE ENDS, IN ORDER TO
- SEAL HOLLOW INTERIOR AND REDUCE AIR LEAKAGE RATE. BLADE AND FRAME SEALS SHALL BE OF EXTRUDED SILICONE. SEALS ARE TO BE SECURED IN AN INTEGRAL SLOT WITHIN THE ALUMINUM
- FXTRUSIONS MAINTENANCE-FREE BEARINGS ARE TO BE COMPOSED OF A CELCON INNER BEARING FIXED TO A 7/16"(11.11MM) ALUMINUM HEXAGON BLADE PIN. ROTATING WITHIN A POLYCARBONATE OUTER BEARING INSERTED IN THE FRAME, RESULTING IN NO METAL-TO-METAL OR
- METAL TO-PLASTIC CONTACT. LINKAGE HARDWARE SHALL BE INSTALLED IN THE FRAME SIDE AND CONSTRUCTED OF ALUMINUM AND CORROSIONRESISTANT, ZINC-PLATED STEEL, COMPLETE WITH CUP-POINT TRUNNION SCREWS FOR A SLIP-PROOF GRIP.
- DAMPERS SHALL BE AVAILABLE WITH EITHER OPPOSED BLADE ACTION OR PARALLEL BLADE ACTION. LEAKAGE SHALL MEET CLASS 1A AT 1" W.G. STATIC PRESSURE
- DIFFERENTIAL. STANDARD AIR LEAKAGE DATA TO BE CERTIFIED UNDER THE AMCA CERTIFIED RATINGS PROGRAM. PRESSURE DROP OF A FULLY OPEN 48" X 48" (1220MM X 1220MM)
- DAMPER SHALL NOT EXCEED .02"(.004KPA) W.G. AT 1000 FPM (5.08
- DAMPERS SHALL BE MADE TO SIZE REQUIRED WITHOUT BLANKING OFF FREE AREA. DAMPERS SHALL BE AVAILABLE IN TWO MOUNTING TYPES: I.E.,

"INSTALLED IN DUCT" OR "FLANGED TO DUCT".

PIPE AND PIPE FITTINGS

- CORROSION ALLOWANCE 0.0625 IN. STEEL PIPE ASTM A53 GR.B ERW OR ASTM A106 GR.B SMLS. SCH
- JOINTS, 2" AND SMALLER SCREWED
- SCREWED FITTINGS 150 LB. MALLEABLE IRON UNIONS CL.150, ASTM A-47 MALLEABLE IRON, ASTM A-153 GALVANIZED, ANSI B2.1 THREADS.
- JOINTS, 2-1/2" AND LARGER WELDED, WITH FLANGES AT CONNECTIONS TO EQUIPMEN BUTT WELD FITTINGS ASTM A234 GR. WFB FLANGES ASTM A105, CLASS 150, RAISED FACE, WELD NECK OR SLIP
- BOLTS ASTM A307 C.S. BOLTS, SQ. HEAD; ASTM A563 NUTS, HEX
- GASKETS 1/16" (1.6 MM) THICK PREFORMED NON-ASBESTOS GRAPHITE FIBRE. COPPER TUBING, 2" AND SMALLER ASTM B88, TYPE L, HARD DRAWN. JOINTS: SOLDER, LEAD FREE, ASTM B32, 95-5 TIN-ANTIMONY, OR
- TIN AND SILVER, WITH MELTING RANGE 220°C TO 280°C. FITTINGS: ASME B16.18, CAST BRASS, OR ASME B16.22, SOLDER WROUGHT COPPER
- THREADED END, COPPER SOLDER END, WATER IMPERVIOUS ISOLATION CONDENSATE DRAIN LINES: 20MM (3/4") AND 25MM (1") TYPE M COPPER, 40 MM (1-1/2") AND LARGER HARD TEMPER COPPER TUBING. TYPE DWV. SOLDERED, WITH WROUGHT COPPER OR COPPER ALLOY DRAINAGE FITTINGS OR CAST BRASS DRAINAGE FITTINGS, CSA

DIELECTRIC UNIONS UNION WITH GALVANIZED OR PLATED STEEL

- GLOBE VALVES (THROTTLING): 2" AND SMALLER: 300 PSIG NON-SHOCK WOG, ASTM B62 BRONZE BODY, COMPOSITION (TEFLON) DISC, RISING STEM, BRONZE TRIM, THREADED ENDS, KITZ #09
- CHECK VALVES (BACKFLOW): 2" AND SMALLER: 300 PSIG NON-SHOCK WOG. ASTM B62 BRONZE BODY. Y-PATTERN HORIZONTAL, SWING TYPE DISC, THREADED ENDS, KITZ #29 BALL VALVES (DRAIN): 2" AND SMALLER: 600 PSIG NON-SHOCK WOG, FORGED BRASS, 2-PIECE, CHROME BALL AND STEM, FULL
- THREADED ENDS, KITZ #68AC STRAINERS: 2" AND SMALLER CLASS 250, 400 PSIG WOG, CAST IRON BODY. Y-PATTERN. SCREWED CAP AND ENDS, A167 304 STAINLESS STEEL SCREEN WITH 1/32" PERFORATIONS.

PORT, BLOW-OUT PROOF PTFE SEATS & STEM, LEVER HANDLE,

HYDRONIC SYSTEM COMPONENTS

- DIAPHRAGM-TYPE EXPANSION TANKS .1 MANUFACTURER
- .2 OTHER ACCEPTABLE MANUFACTURERS OFFERING EQUIVALENT PRODUCTS.
- .1 EXPANFLEX. .2 ITT BELL & GOSSET. .2 CONSTRUCTION: WELDED STEEL, TESTED AND STAMPED TO ASME SEC 8-D; SUPPLIED WITH NATIONAL BOARD FORM U-1, RATED FOR WORKING PRESSURE OF 125 PSI (860 KPA), WITH FLEXIBLE
- BUTYL DIAPHRAGM SEALED INTO TANK, AND STEEL SUPPORT .3 ACCESSORIES: PRESSURE GAUGE AND AIR-CHARGING FITTING, TANK DRAIN; PRECHARGE TO 11 PSI (80 KPA). .4 AUTOMATIC COLD WATER FILL ASSEMBLY: PRÉSSURE REDUCING VALVE, REDUCED PRESSURE DOUBLE CHECK BACK FLOW PREVENTER, TEST COCKS, STRAINER, VACUUM BREAKER, AND
- VALVED BY-PASS. .1 SIZE: SIZED BASED ON ASHRAE

AIR VENTS

- .1 L TYPE: SHORT VERTICAL SECTIONS OF 2" (50 MM) DIAMETER PIPE TO FORM AIR CHAMBER, WITH 3 MM BRASS NEEDLE VALVE AT TOP OF CHAMBER.
- .2 FLOAT TYPE: .1 MANUFACTURERS: .1 ARMSTRONG.
- .2 AMTROL. .2 BRASS OR SEMI-STEEL BODY, COPPER, POLYPROPYLENE, OR SOLID NON-METALLIC FLOAT, STAINLESS STEEL VALVE AND VALVE SEAT; SUITABLE FOR SYSTEM OPERATING TEMPERATURE

AND PRESSURE; WITH ISOLATING VALVE.

MECHANICAL SPECIFICATIONS

.3 AIR SEPARATORS MANUFACTURERS:

- 1 AMTROL. .2 ARMSTRONG.
- .3 ITT BELL & GOSSETT.
- STEEL, TESTED AND STAMPED TO ASME SEC 8-D; FOR 125 PSI (860 KPA) OPERATING PRESSURE, TANGENTIAL INLET AND OUTLET CONNECTIONS, AND INTERNAL STAINLESS STEEL AIR COLLECTOR TUBE.

PIPE INSULATION

- A. MINIMUM PIPE INSULATION SHALL CONFORM TO CURRENT ASHRAE 90.1 AND SHALL BE MOUNTED GLASS FIBRE INSULATION WITH VAPOUR BARRIER JACKET, EQUAL TO FIBREGLASS OF CANADA INC.; STANDARD TEMP PIPE INSULATION WITH ASJ; MANSON INSULATION INC. ALLEY-K WITH APT; KNAUF FIBREGLASS OR ROXUL-SEITZ.
- B. INSULATE NEW [OR ALTERED] PIPING WITH RIGID PIPE INSULATION AS FOLLOW:

SERVICE	THICKNESS		
CONDENSER WATER (EXTERIOR)	50MM	(2")	
GLYCOL HOT WATER HEATING SUPPLY	25MM	(1")	
GLYCOL HOT WATER HEATING RETURN	25MM	(1")	
LOW PRESSURE CONDENSATE	13MM	(1/2")	

VERTICAL IN-LINE PUMPS

- TYPE: VERTICAL, SINGLE STAGE, CLOSE COUPLED, RADIALLY OR HORIZONTALLY SPLIT CASING, FOR IN-LINE MOUNTING, FOR 175 PSI
- (1200 KPA) WORKING PRESSURE. CASING: CAST IRON, WITH SUCTION AND DISCHARGE GAUGE PORT, CASING WEAR RING, SEAL FLUSH CONNECTION, DRAIN PLUG, FLANGED SUCTION AND DISCHARGE.
- IMPELLER: BRONZE, FULLY ENCLOSED, KEYED DIRECTLY TO MOTOR SHAFT OR EXTENSION. SHAFT: CARBON STEEL WITH STAINLESS STEEL IMPELLER CAP SCREW OR
- NUT AND BRONZE SLEEVE. SEAL: CARBON ROTATING AGAINST A STATIONARY CERAMIC SEAT, VITON FITTED, 225°F (107°C) MAXIMUM CONTINUOUS OPERATING TEMPERATURE. SUCTION GUIDES: CAST IRON BODY, OUTLET GUIDE VANES, REMOVABLE STAINLESS STEEL STRAINER, AND FINE MESH BRASS START-UP STRAINER. PRESSURE DROP NOT TO EXCEED 2 FEET OF WATER AND
- SYSTEM VELOCITY NOT TO EXCEED 6 FPS, EACH OF WHICH WILL BE INDICATED ON SHOP DRAWING SUBMITTAL. FLO-TREK CONTROL VALVES: ANGLE TYPE COMBINATION SHUT-OFF BALANCING AND CHECK VALVE WITH POSITIVE SPRING LOADED SEATING, FLANGED CAST IRON BODY DISC AND SEAT, STAINLESS STEEL STEM AND SPRING. PRESSURE DROP NOT TO EXCEED 3 FEET OF WATER AND SYSTEM VELOCITY NOT TO EXCEED 6 FPS, EACH OF WHICH WILL BE
- NDICATED ON INDICATED ON SHOP DRAWING SUBMITTAL. PERFORMANCE: AS SCHEDULED WIRING TERMINATIONS: PROVIDE TERMINAL LUGS TO MATCH BRANCH CIRCUIT CONDUCTOR QUANTITIES, SIZES, AND MATERIALS INDICATED.
- ENCLOSE TERMINAL LUGS IN TERMINAL BOX SIZED TO CODE. INSTALL TO MANUFACTURER'S INSTRUCTIONS AND AS INDICATED BY FLOW ARROWS. SUPPORT PIPING ADJACENT TO PUMP SUCH THAT NO WEIGHT IS CARRIED ON PUMP CASINGS. PROVIDE ACCESS SPACE AROUND PUMPS FOR SERVICE. PROVIDE NO LESS THAN MINIMUM RECOMMENDED BY MANUFACTURER. DECREASE FROM LINE SIZE WITH LONG RADIUS REDUCING ELBOWS OR REDUCERS. PROVIDE LINE SIZED SHUT-OFF VALVE AND STRAINER ON PUMP SUCTION. AND LINE SIZED SOFT SEAT CHECK VALVE AND BALANCING VALVE ON PUMP DISCHARGE. PROVIDE AIR COCK AND DRAIN CONNECTION ON HORIZONTAL PUMP CASINGS. PROVIDE DRAINS FOR BASES AND SEALS, PIPED TO AND DISCHARGING INTO FLOOR DRAINS. LUBRICATE PUMPS BEFORE

REFRIGERANT PIPING

- a. TUBING: SHALL BE PROCESSED FOR REFRIGERATION INSTALLATIONS. DEOXIDIZED , DEHYDRATED AND SEALED SUCH AS HARD COPPER TO ASTM B280, TYPE ACR OR ANNEALED COPPER TO ASTM B280, WITH
- MINIMUM WALL THICKNESS AS PER CSA B52 AND ANSI/ ASME B31.5. a. SERVICE: SHALL HAVE A SERVICE DESIGN PRESSURE OF 2.1MPA (300PSI) AND TEMPERATURE OF 121°C (250°F)
- ASME B16.22, WITH SILVER JOINTS AND NON CORROSIVE FLEX. OR c. FLANGED:

b. BRAZED FITTINGS: FITTINGS SHALL BE WROUGHT COPPER TO ANSI/

1) BRONZE OR BRASS, TO ANSI/ ASME B16.24, CLASS 150 AND 2) GASKETS: SUITABLE FOR SERVICE BOLTS, UNITS AND WASHERS: TO ASTM A307, HEAVY SERIES

PIPE SLEEVES a. HARD COOPER OR STEEL, SIZED TO PROVIDE 6MM (1/4") CLEARANCE

d. FLARED: BRONZE OR BRASS, FOR REFRIGERATION, TO ANSI/ASME

ALL AROUND BETWEEN SLEEVE AND UNINSULATED PIPE OR BETWEEN

- a. 22MM (13/16") AND UNDER CLASS 500, 3.5MPA (508PSI) GLOBE OR ANGLE NON-DIRECTIONAL TYPE, DIAPHRAGM, PACKLESS TYPE, WITH FORGED BRASS BODY AND BONNET, MOISTURE PROOF SEAL FOR BELOW FREEZING APPLICATIONS, BRAZED CONNECTIONS. BALL VALVES MEETING THIS SAME PERFORMANCE CRITERIA AND SUITABLE FOR
- REFRIGERATION SYSTEMS ARE ACCEPTABLE. b. OVER 22MM (13/16"): CLASS 375, 2.5MPA (363PSI) GLOBE OR ANGLE TYPE, DIAPHRAGM, PACKLESS TYPE, BACK— SEATING, CAP SEAL, WITH CAST BRONZE BODY BONNET, MOISTURE PROOF SEAL FOR BELOW FREEZING APPLICATIONS, BRAZED CONNECTIONS. BALL VALVES MEETING THIS SAME PERFORMANCE CRITERIA AND SUITABLE FOR REFRIGERATION SYSTEMS ARE ACCEPTABLE.
- C. ISOLATION BALL VALVES COMPLETE WITH INTEGRAL SCHRADER ACCESS PORTS TO BE INSTALLED AT THE BC CONTROLLER ON EACH (SUPPLY AND RETURN) BRANCH PIPE RUN TO EACH INDOOR UNIT -EMERSON TYPE BVS SERIES REFRIGERATION BALL VALVE (WITH ACCESS PORT) OR EQUIVALENT BY OTHER MANUFACTURER. ISOLATION BALL VALVES SHALL ALSO BE INSTALLED AT THE (SUPPLYAND RETURN) CONNECTIONS TO EACH BC CONTROLLER FROM THE OUTDOOR UNIT.
- a. INSTALL IN ACCORDANCE WITH CSA B52, EPS 1/RA/1 AND ANSI/ ASME B31.5. CONNECT TO EQUIPMENT WITH ISOLATING VALVES. PROVIDE SPACE FOR SERVICING, DISASSEMBLY AND REMOVAL OF EQUIPMENT AND COMPONENTS ALL AS RECOMMENDED BY MANUFACTURER. PROTECT ALL OPENINGS IN PIPING AGAINST ENTRY OF FOREIGN MATERIAL, CONTAMINANTS, AND MOISTURE. D. ISOLATION VALVES (BALL VALVES) SHALL BE INSTALLED AT THE
- CONDENSER INLET (DISCHARGE LINE), CONDENSER OUTLET (CONDENSATE OR LIQUID LINE), RECEIVER INLET AND RECEIVER c. REFRIGERATION SYSTEMS LARGER THAT 11KW (3 TONS) OR REFRIGERATION SYSTEMS IN AIR CONDITIONING SYSTEMS LARGER THAN (18KW) 5 TONS SHALL BE INSTALLED IN ACCORDANCE WITH THE
- BRAZING PROCEDURES a. BLEED INERT GAS INTO PIPE DURING BRAZING. REMOVE VALVE INTERNAL PARTS, SOLENOID VALVE COINS AND SIGHT GLASSES. DO NOT APPLY HEAT NEAR EXPANSION VALVE AND BULB AND OTHER TEMPERATURE SENSITIVE COMPONENTS.

TECHNICAL STANDARDS AND SAFETY ACT.

PIPING INSTALLATION a. SOFT ANNEALED COPPER TUBING — BEND WITHOUT CRIMPING OR CONSTRICTION. (HARD DRAWN COPPER TUBING- DO NOT BEND. MINIMIZE USE OF FITTINGS - OFFSETS CAN BE FABRICATED BY HEATING THE PIPE).

MECHANICAL SPECIFICATIONS

- HOT GAS LINES AND SUCTION LINES a. PITCH AT LEAST 12MM PER 3M (1/2" PER 10') DOWN IN DIRECTION OF FLOW TO PROMOTE OIL RETURN TO COMPRESSOR DURING OPERATION
 - b. PROVIDE TRAP AT BASE OF RISERS GREATER THAN 2.4M (8') HIGH AND AT EACH 7.6M (25') THEREAFTER.
 - . PROVIDE INVERTED DEEP TRAP AT TOP OF EACH RISER. d. PROVIDE DOUBLE RISERS FOR COMPRESSORS HAVING CAPACITY MODULATION.
- 1) LARGE RISER: INSTALL TRAPS AS SPECIFIED ABOVE. 2) SMALL RISER: SIZE FOR 508M/S (1000FT/MIN) AT MINIMUM LOAD. CONNECT UPSTREAM OF TRAPS ON LARGE RISER.
- PRESSURE AND LEAK TESTING a. CLOSE VALVES ON ALL FACTORY CHARGED EQUIPMENT AND OTHER EQUIPMENT NOT DESIGNED FOR TEST PRESSURES. LEAK TEST TO CSA B52 BEFORE EVACUATION TO 1.5 TIMES WORKING PRESSURE ON BOTH HIGH AND LOW SIDES. TEST WITH NITROGEN TO REQUIRED PRESSURE. TEST FOR LEAKS WITH DETECTOR, REPAIR LEAKS AND REPEAT TESTS.

SOLENOID VALVES MAY HAVE TO BE ENERGIZED TO CARRY OUT

PRESSURE TESTING AND EVACUATION TO ELIMINATE ISOLATED SECTION

OF THE SYSTEM.

DEHYDRATION AND CHARGING

- a. CLOSE SERVICE VALVES ON FACTORY CHARGED EQUIPMENT AMBIENT TEMPERATURES TO BE AT LEAST +13°C (55°F) FOR AT LEAST 12 HOURS BEFORE AND DURING DEHYDRATION. USE COPPER LINES OF LARGEST PRACTICAL SIZE TO REDUCE EVACUATION TIME. USE 2-STAGE VACUUM PUMP WITH GAS BALLAST ON 2ND STAGE CAPABLE OF PULLING AT LEAST 100 MICRONS (0.053"W.C.) AND FILLED WITH DEHYDRATED OIL. MEASURE SYSTEM PRESSURE WITH VACUUM GAUGE. TAKE READINGS WITH VALVE BETWEEN VACUUM PUMP AND SYSTEM CLOSED. TRIPLE EVACUATE ALL SYSTEM COMPONENTS CONTAINING REFRIGERANT GASES OTHER THAN CORRECT REFRIGERANT CHARGE OR HOLDING CHARGE AS FOLLOWS:
- 1) A STANDING VACUUM OF 250 MICRONS (0.134"W.C.) OR LESS FOR A PERIOD OF NOT LESS THAN 2 HOURS.
- 2) A STANDING VACUUM OF 250 MICRONS (0.134"W.C.) OR LESS FOR A PERIOD OF NOT LESS THAN 12 HOURS. 3) SUBMIT ALL TEST RESULTS TO ENGINEER.
- CHARGING: CHARGE SYSTEM THOUGH FILTER-DRYER AND CHARGING VALVE ON HIGH SIDE. LOW SIDE VAPOUR CHARGING ONLY IS PERMITTED WITH COMPRESSOR OFF, CHARGE ONLY AMOUNT NECESSARY FOR PROPER OPERATION OF SYSTEM. IF SYSTEM PRESSURE EQUALIZE BEFORE SYSTEM IS FULLY CHARGED. CLOSE CHARGING VALVE AND START UP WITH UNIT OPERATING, ADD REMAINDER OF CHARGE TO SYSTEM. RE-PRUGE CHARGING LINE IF REFRIGERANT CONTAINER IS
- CHANGED DURING CHARGING PROCESS. c. CHECKS: MAKE ALL CHECKS AND MEASUREMENTS AS PER MANUFACTURERS OPERATION AND MAINTENANCE INSTRUCTIONS. RECORD AND REPORT ALL MEASUREMENTS IN WRITING TO ENGINEER. NO REFRIGERANT SHALL BE PURGED.

- a. APPLY INSULATION AFTER REQUIRED TESTS HAVE BEEN COMPLETED AND REVIEWED BY CONSULTANT. INSULATION AND SURFACES SHALL BE CLEAN AND DRY WHEN
- INSTALLED AND DURING APPLICATION OF ANY FINISH ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. INSULATE ALL REFRIGERANT SUCTION AND HOT GAS PIPING AND TITTINGS WITH FLEXIBLE FOAMED PLASTIC PIPE INSULATION. INSULATION SHALL FIT PIPE. THICKNESS SHALL BE AS FOLLOWS: 1/2" (13 MM) THICK FOR PIPE 1" (25 MM) O.D. AND SMALLER; 3/4" (20 MM) THICK FOR PIPE 1-1/8" (28 MM) TO 2" (50 MM)
- O.D.; 1" (25 MM) THICK FOR PIPES 2-1/8" (54MM) O.D. AND d. SLIP INSULATION ON TO TUBING BEFORE TUBING SECTIONS AND FITTINGS ARE ASSEMBLED. KEEP SLITTING OF INSULATION TO A VERY MINIMUM. SEAL ALL JOINTS IN THE INSULATION WITH
- ARMAFLEX 520 BLV. INSULATE FLEXIBLE PIPE CONNECTORS. e. ON INSULATION EXPOSED OUTSIDE THE BUILDING, PLACE "SLIT" JOINT SEAMS ON BOTTOM OF PIPE AND PROVIDE TWO COATS OF GREY ARMAFLEX FINISH. EXTEND INSULATION THROUGH PIPE SUPPORT CLAMPS. PROVIDE A 6" (150 MM) LONG, 20 GAUGE (1.1 MM) GALVANIZED STEEL SLEEVE AROUND PIPE INSULATION AT

FLUID COOLER

EACH SUPPORT

WITH SECTION 2.

- A. CONFORM TO THE GENERAL PROVISIONS FOR MECHANICAL SECTION 1- GENERAL CONDITIONS. B SUBMITTALS SUBMIT SHOP DRAWINGS AND PRODUCT DATA IN ACCORDANCE
- D. INDICATE THE FOLLOWING: COMPLETE SPECIFICATIONS; WIRING DIAGRAMS (SHOWING ALL INTERCONNECTIONS); WEIGHT; PERFORMANCE DETAILS.

E. PROVIDE DATA FOR INCLUSION IN THE OPERATING AND

SCOPE OF WORK.

PARTITIONS.

FAN AND FAN GUARD

INSPECTION AND CLEANING.

PRODUCTS A. GENERAL B. PROVIDE REF-PLUS AIR COOLED FLUID COOLER OR EQUIVALENT (EVAPCO OR OTHER- TO BE APPROVED BY CONSULTANT) ARRANGED FOR VERTICAL AIRFLOW. EACH FLUID COOLER SHALL CONSIST OF A CASING, COIL, AND MULTIPLE ZIEHL-ABEGG TWIN SPEED FANS DRIVEN BY INDEPENDENT EXTERNAL ROTOR

MAINTENANCE MANUALS IN ACCORDANCE WITH SECTION 2-

MOTORS, FAN GUARDS, MOUNTING LEGS AND CONTROLS. THE COILS SHALL BE CONSTRUCTED OF SEAMLESS MICROGROOVE COPPER TUBES MECHANICALLY EXPANDED INTO CONTINUOUS, RIPPLED ALUMINUM PLATE TYPE FINS. COILS SHALL BE FACTORY LEAK TESTED AT 400 PSIG. COILS SHALL BE LEAK TESTED, DEHYDRATED, EVACUATED AND SEALED WITH END CAPS BRAZED ON COIL CONNECTIONS. THE CASING SHALL BE CONSTRUCTED OF REINFORCED CONTINUOUS GALVANIZED STEEL AND BE DIVIDED INTO INDIVIDUAL FAN SECTIONS BY FULL WIDTH GALVANIZED

ALL TUBE SHEETS SHALL BE PROVIDED WITH OVERSIZED HOLES

- AND TUBES SHALL BE SUPPORTED ON SLIDING CUSHIONS. A. THE CONDENSER CASING SHALL BE OF HEAVY GAUGE G90 GALVANIZED STEEL WITH PLATED HARDWARE FOR CORROSION FREE ASSEMBLY. EXTERIOR CASING SHALL BE CLEANED AND PHOSPHATIZED. THEN PAINTED WITH A URETHANE FINISH. B. SIDE ACCESS PANELS SHALL BE INCLUDED FOR EASY COIL
- A. FANS SHALL BE DIE CAST ALUMINUM, PROFILED FOR OPTIMAL SOUND BEHAVIOR AND LOW NOISE. FANS ARE 31 1/2" DIAMETER WITH 7 BLADES. FAN HUBS ARE TO BE INTEGRATED TO EXTERNAL MOTOR ROTORS. PROVIDE 7 1/4" FULL BULL MOUTH VENTURIES. FAN GUARDS AND MOTOR MOUNTS SHALL BE WELDED WIRE CONSTRUCTION WITH BAKED ON EPOXY COATING.

ROTOR DESIGN. BEARINGS SHALL BE PERMANENTLY

BE TWO SPEED (550/780 RPM), CLASS F INSULATION,

THERMALLY PROTECTED 575/3/60 VOLT. OPTIONS A. FAN CYCLING CONTROL PANEL - UNIT SHALL BE SUPPLIED WITH FACTORY INSTALLED LINE VOLTAGE TERMINAL BLOCK, 24 VOLT TRANSFORMER, TIME CLOCK TERMINALS, FAN CYCLING THERMOSTATS, SENSORS, AND FAN CONTACTORS, ALL MOUNTED IN A WEATHERPROOF CONTROL PANEL. FAN MOTORS ARE WIRED THROUGH THE CONTACTORS BACK TO THE MAIN UNIT

A. MOTORS SHALL BE TOTALLY ENCLOSED, SOFT START, REVERSE

LUBRICATED, DOUBLE SEALED, DEEP GROOVE. MOTORS SHALL

TERMINAL BLOCK.

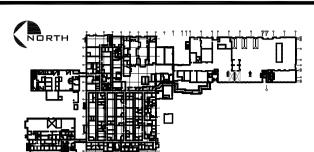
- A. INSTALL UNITS IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
- B. CO-ORDINATE WITH ELECTRICAL DIVISION ALL FIELD WIRING FROM CONDENSING UNIT TO ALARMS, SENSORS, ETC. CO-ORDINATE WITH CONTROLS CONTRACTOR FIELD INSTALLED CONTROLS FOR CONDENSING UNIT.

District 1

Environment Canada
Environment Canada Environnement Canada

District 1

Property Management Gestion de l'immobilier



BUILDING KEY PLAN

LEGEND

REISSUED FOR TENDER 28-NOV-2014 ISSUED FOR TENDER 26-FEB-2014



Description

Date

LONDON · HAMILTON · WINDSOR · OTTAWA 1130 MORRISON DRIVE, SUITE 260, OTTAWA, ON K2H 9N6

3 location drawing

sur dessin no.

VANDERWESTEN RUTHERFORD MANTECON INC

CONSULTING STRUCTURAL/MECHANICAL/ELECTRICAL ENGINEERS

VRM#13-110 no. du detail

drawing no.

MODULE 5 VRF SYSTEM

ENVIRONMENT CANADA

335 River Rd

ENVIRONMENT CANADA

Ottawa ON. K1V 1C7 **MECHANICAL**

SPECIFICATIONS

esigned By Conçu pa (yyyy/mm/d Drawn By M.C. Dessiné pa (yyyy/mm/d Reviewed By M.C. Examiné pa (yyyy/mm/d pproved By Approuvé pa (vvvv/mm/d Soumissio

Drawing no. No. du dessi

Administrateur de proje

Consultant Proj no

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C PMDI Proj no.

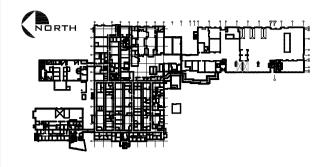
MECHANICAL SPECIFICATIONS

- 19 <u>VFD (FOR GENERAL EXHAUST FAN 5)</u>
- A. BASE BID : DANFOSS VLT HVAC FC102 VARIABLE FREQUENCY DRIVE (5 HP, 575V).
- ALTERNATE SUPPLIERS BY ABB AND ALLEN BRADLEY MAY BE CONSIDERED. CONTRACTOR SHALL ENSURE MODELS PROPOSED ARE EQUAL TO DANFOSS MODEL SPECIFIED.
- C. THE VFD SHALL BE C-UL, AND NEMA TYPE 1 AS REQUIRED FOR INDOOR APPLICATIONS.
- D. THE VFD SHALL INCLUDE A STANDARD EIA-485 COMMUNICATIONS PORT AND CAPABILITIES TO BE CONNECTED TO THE FOLLOWING SERIAL COMMUNICATION PROTOCOLS AT NO ADDITIONAL COST AND WITHOUT A NEED TO INSTALL ANY ADDITIONAL HARDWARE OR SOFTWARE IN THE VFD: REGULVAR (DELTA CONTROLS).
- THREE-CONTACTOR BYPASS SHALL BE PROVIDED THAT ALLOWS OPERATION OF THE MOTOR VIA LINE POWER IN THE EVENT OF A FAILURE OF THE VFD. MOTOR CONTROL SELECTION SHALL BE THROUGH EITHER A VFD OUTPUT CONTACTOR OR A BYPASS CONTACTOR THAT ARE ELECTRICALLY INTERLOCKED TO ENSURE THAT BOTH CONTACTORS ARE NOT ENERGIZED SIMULTANEOUSLY. A THIRD CONTACTOR, THE DRIVE INPUT CONTACTOR, SHALL BE SUPPLIED AS STANDARD. THIS ALLOWS THE POWERING OF THE VFD WITH THE MOTOR OFF OR OPERATING IN BYPASS MODE FOR TESTING, PROGRAMMING AND TROUBLESHOOTING PURPOSES. IF A TWO CONTACTOR BYPASS WITH A SERVICE SWITCH FOR THE VFD INPUT IS PROVIDED, THEN A DOOR MOUNTED HANDLE MUST BE PROVIDED TO POWER ON/OFF THE INPUT TO THE VFD WITHOUT THE NEED TO OPEN
- THE MANUFACTURER SHALL PROVIDE START-UP COMMISSIONING OF THE VFD AND ITS OPTIONAL CIRCUITS BY A FACTORY CERTIFIED SERVICE TECHNICIAN WHO IS EXPERIENCED IN START-UP AND REPAIR SERVICES. SALES PERSONNEL AND OTHER AGENTS WHO ARE NOT FACTORY CERTIFIED SHALL NOT BE ACCEPTABLE AS COMMISSIONING AGENTS. START-UP SERVICES SHALL INCLUDE CHECKING FOR VERIFICATION OF PROPER OPERATION AND INSTALLATION FOR THE VFD, ITS OPTIONS AND ITS INTERFACE WIRING TO THE BUILDING AUTOMATION SYSTEM.
- G. THE COMPLETE VFD SHALL BE WARRANTED BY THE MANUFACTURER FOR A PERIOD OF 60 MONTHS FROM DATE OF SHIPMENT. THE WARRANTY SHALL INCLUDE PARTS, LABOR, TRAVEL COSTS AND LIVING EXPENSES INCURRED BY THE MANUFACTURER TO PROVIDE FACTORY AUTHORIZED ON-SITE SERVICE. THE WARRANTY SHALL BE PROVIDED BY THE VFD MANUFACTURER AND NOT A THIRD PARTY
- 20 EXHAUST FAN UPGRADE GENERAL:
- CONTRACTOR SHALL UPGRADE EXISTING GENERAL EXHAUST FAN NO.5 FROM 2 HP TO 5 HP. EXISTING MOTOR AND VFD SHALL BE DISCONNECTED BY ELECTRICAL CONTRACTOR AND REMOVED BY MECHANICAL CONTRACTOR. EXISTING FAN IS CARNES MODEL VUBK24P1H1CA20SPC1 (1.26" SP, 2 HP, 575/3/60, 1759 RPM, BELT DRIVE). MECHANICAL CONTRACTOR SHALL SUPPLY AND INSTALL NEW VFD COMPATIBLE RATED MOTOR, AND VFD. ELECTRICAL CONTRACTOR SHALL WIRE MOTOR AND VFD. FAN MOTOR UPGRADE SHALL ALSO INCLUDE FOR NEW BELTS, PULLEYS, AND MOUNTS AS NECESSARY FOR NEW MOTOR.
- . CONTROLS CONTRACTOR SHALL:
- DISCONNECT EXISTING VFD CONTROLS POINTS and RECONNECT NEW VFD POINTS BACK to BAS
- A) ADJUST STATIC PRESSURE SETPOINT FROM 1" WC TO MAXIMUM OF 1.75" WC (USER ADJUSTABLE).
- C) VERIFY and UPDATE BAS FRONT END GRAPHICS as NECESSARY.

22. AIR BALANCER SHALL:
TAKE TOTAL AIR VOLUME and STATIC PRESSURE SYSTEM READINGS BEFORE AND AFTER FAN UPGRADE AND PROVIDE IN FINAL FAN PERFORMANCE REPORT. AIR BALANCER TO TAKE FINAL FAN READINGS WITH LAB 159 GENERAL EXHAUST OPERATING IN A PURGE MODE WHILE NEW FAN OPERATING AT NEW STATIC PRESSURE SET POINT, AND ALTERNATIVELY SAME VERIFICATION WITH LAB 165 in PURGE MODE. CONFIRM and REPORT LAB 159 and 165 OPERATION AT NEW PURGE AIR VOLUMES ALONG WITH FAN OPERATING at NEW STATIC PRESSURE SET POINT. COORDINATE SYSTEM VERIFICATION WITH CONTROLS CONTRACTOR.

Environment Canada Environnement Canada

Property Management Gestion de l'immobilier District 1 District 1



BUILDING KEY PLAN

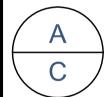
LEGEND

REISSUED FOR TENDER 28-NOV-2014 26-FEB-2014 ISSUED FOR TENDER Date Description



VANDERWESTEN RUTHERFORD MANTECON INC. CONSULTING STRUCTURAL/MECHANICAL/ELECTRICAL ENGINEERS LONDON · HAMILTON · WINDSOR · OTTAWA

1130 MORRISON DRIVE, SUITE 260, OTTAWA, ON K2H 9N6



no. du detail B location drawing n sur dessin no. C drawing no.

ENVIRONMENT CANADA MODULE 5 VRF

SYSTEM **ENVIRONMENT CANADA** 335 River Rd Ottawa ON. K1V 1C7

MECHANICAL SPECIFICATIONS

Designed By Conçu pai (yyyy/mm/do Dessiné pa Drawn By M.C. (yyyy/mm/do Reviewed By M.C. Examiné par (yyyy/mm/do Approved By Approuvé pa (yyyy/mm/do Soumission

Project Manager Administrateur de projets EC PMDI Proj no. Consultant Proj no 13-110

Drawing no.

M-701

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